PROCEEDINGS

THIRTY-SEVENTH ANNUAL WESTERN INTERNATIONAL FOREST DISEASE WORK CONFERENCE

AND THE

FORTIETH ANNUAL WESTERN FOREST INSECT WORK CONFERENCE

THE INN of the SEVENTH MOUNTAIN

BEND, OREGON

SEPTEMBER 11 - 15, 1989

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OF THE

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INN OF THE SEVENTH MOUNTAIN

BEND, OREGON

SEPTEMBER 11 - 15, 1989

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The contents of these proceedings are for the information of the attendees. They are not available for citation or publication in whole or in part without the consent of the authors concerned. Contributions of the proceedings appear as submitted.

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JOINT MEETING OF THE WESTERN INTERNATIONAL FOREST DISEASE WORK CONFERENCE AND THE FORTIETH WESTERN FOREST INSECT WORK CONFERENCE

September 11-15, 1989 at the Inn of the Seventh Mountain, Bend, Oregon

FINAL PROGRAM

Monday, September 11

4:00pm - 9:00pm Registration

7:00pm - 9:00pm No-host Mixer [Cascade]

7:00pm - 8:00pm WFIWC Executive Committee meeting [Summit]

7:00pm - 9:00pm North American Forestry Commission meeting [Penthouse]

Tuesday, September 12

7:00am - 12:00pm Registration

8:00am - 9:00am Business Meetings [WIFDWC: Cascade; WFIWC: Summit]

9:00am - 9:30am Break

Joint WIFDWC/WFIWC session [Summit/Mountain/Cascade]

9:30am - 10:00am Welcome and Announcements - Chairmans' Addresses

10:00am - 12:00pm Panel : The Challenge of Pest Management with Uneven-aged Management
Moderator: Everett Hansen (OSU)
Panel Members: Timothy Lillebo (Or Nat. Res. Council)
Richard Everett (USFS - PNW)
Donald Wood (USFS - OCH)
Wyman Schmidt (USFS - INT)

12:00pm - 1:30pm Lunch (included in registration fee) [Pavilion]

1:30pm - 3:00pm Concurrent Workshops (Moderators)

(A) Interactions among Root Diseases and Bark Beetles (Don Owen, CDF and Jill Wilson, USFS) [Summit]

(B) Hazard-rating & Risk-rating: New Systems & New Uses (Sue Hagle, USFS and Terry Shore, Forestry Canada) [Cascade South]

(C) Roles of Insects and Pathogens in Long-term Site Productivity (Keith Reynolds, USFS and Tim Schowalter OSU) [Pavilion]

(D) Nursery/Seedling Pest Management (Diane Hildebrand, USFS and Gwen Shrimpton, Surry Nursery) [Condominium]

(E) Pest Impact Assessment for Non-timber Resources (Fred Baker, Utah St. and Ann Lynch, USFS) [Penthouse]

(F) Techniques for Measuring Important Host Characteristics Relevant to Pests: Tree Vigor and Nutrient Status (Ellen Michael Goheen, USFS and Mike Wagner, NAU) [Cascade North]

(G) Silvicultural Strategies for Pest Complexes (Dayle Bennett, USFS and Borys Tkacz, USFS) [Mountain]

3:00pm - 3:30pm Break

3:30pm - 5:00pm Concurrent Workshops

(A) Tree Pathogen/Defoliator Interactions (Judy Pasek, USFS and Catherine Parks, USFS) [Summit]

(B) Uneven-aged Management and Pests; Case Studies (Helen Maffei, USFS and Jo Booser, USFS) [Mountain]

(C) Hot Stuff! Demonstrations of New Computer Applications for Forest Pest Management (Bov Eav, USFS) [Chair's Suite]

(D) Pest Management in Young Stands (Will Littke, Weyerhauser and Lorraine MacLauchlin, B.C. Min. For.) [Penthouse]

(E) Advances in Biological Control of Forest Pests (John Harris, Forestry Canada) [Condominium

(F) Climatic changes, Air Pollution, & Pest Interactions (Karel Stoszek, Univ. ID and Paul Hennon, USFS) [Cascade North]

(G) International Forest Pest Management (Terry Shaw, USFS and Bill Ciesla, USFS) [Cascade South]

5:30pm - 7:00pm Set up posters [Mountain]

7:30pm - 9:00pm Poster Session [Mountain]
Continuation of computer demonstrations [Mountain]

Wednesday, September 13

7:30am - 8:00am Board buses -- buses will leave at 8:00am!!

8:00am - 5:00pm Field Trip: Pest Management and Pine Silviculture

Location: Pringle Falls, La Pine State Park (Eastside of the Cascades, Deschutes County, Central Oregon)
Box lunches will be provided

8:00am - 5:30pm Special Session: Current Research on Wood Destroying Organisms and Future Prospects for Protecting Wood-in-Use
Organizers: Michael Haverty and Wayne Wilcox [Cascade]

5:30pm - ??? **FUN RUN**

7:30pm - 9:00pm Special Papers

Steve Seybold (UC Berkeley) Stereospecificity of pheromone production and response by pine engraver beetles in the genus Ips.

Stefan Zeglen (Utah St. Univ.) Observations of Armillaria in a stand of lodgepole pine.

Alan MacKenzie (Univ. of Calgary) Successful pheromone blend for manipulating spruce beetles (Dendroctonus rufipennis).

David Shaw (Univ. of Washington) Occurrence and impacts of root decay fungi in precommercially thinned and unthinned western hemlock.

Kenneth R. Hobsen (UC Berkeley) Do bark beetles need to kill trees? A reconsideration of the role of vectored fungi.

Walt Thies (USFS-PNW) Application of chloropicrin to laminated root rot infected stumps: A starting point.

R.S. Hunt (For. Canada) Clarification on the use of ":", "ex" and double "ii" in botanical nomenclature.

Thursday, September 14

7:30am - 8:00am Board buses -- buses will leave at 8:00am!!

Field Trip: Integrated Pest Management - implications of forest pests for quality silvicultural prescriptions for mixed conifer stands

Location: stands west of Sisters, OR in the Toll Road and/or Jack Creek area

Box lunches will be provided

8:00am - 5:00pm North American Forestry Commission meeting [Penthouse]

Mini-panels / Workshops

8:30am - 10:00am Concurrent Panels

(A) Induced Defenses in Plants and Their Role in Plant-Pest Interactions [Cascade]

Moderator: Mike Wagner (NAU)
Panel Members: George Ferrell (USFS-PSW)
Mike Wagner (NAU)
Bill Otrosina (USFS-PSW)

(B) Biotechnology in Forest Disease and Insect Research: Power, Promise, and Pitfalls [Summit]
Moderator: Marge Palmer (USFS-PNW)
Panel Members: Steve Strauss (OSU)
Paula Spaine (USFS-SE)
Bob Stack (No. Dakota St. Univ.)
Jim Stewart (USFS-WO)

10:00am - 10:30am Break

10:30am - 12:00pm Concurrent Workshops

(A) Estimating/Predicting Multiple-pest Impacts on Stands (Mike Marsden, USFS and Peter Hall, B.C. Min. For.) [Baron]

(B) Influence of Induced Changes in Host Nutrients and Defensive Chemistry on Insects and Pathogens (Catherine Parks, USFS and Karen Clancy, USFS) [Mountain]

(C) Biotechnology -- continuation of earlier panel discussion (Steve Strauss, OSU) [Summit]

(D) Management of Seed and Cone Pests (Roger Sandquist, USFS and Jack Sutherland, PFRC) [Cascade South]

(E) Current Status of B.t. Products (Roy Beckwith, USFS) [Cascade N.]

12:00pm - 1:30pm Lunch (included in registration fee) [Pavilion]

1:30pm - 3:00pm Concurrent Workshops

(A) Urban Forest Pest Management (Tim Paine, UC Riverside and Ken Russell, WA DNR) [Mountain]

(B) Pathogen/Insect Interactions as Vectors (John Muir, B.C. Min. For. and Jeff Witcosky, USFS) [Summit]

(C) Techniques for Studying Dispersal (Bill Thoeny, USFS) [Baron]

(D) Tips for Improving Presentations (Lonne Sower, USFS) [Cascade N.]

(E) Choristoneura Distribution and Taxonomy, Part I (George Harvey, Forestry Canada) [Cascade South)

3:00pm - 3:30pm Break

3:30pm - 5:00pm Concurrent Workshops

(A) Topkill Caused by Insects and Diseases (Brian Geils, USFS and Rene Alfaro, Forestry Canada) [Summit]

(B) Research Priorities for the 1990's: an FPM Perspective (Dave Holland, USFS and Jim Byler, USFS) [Cascade North]

(C) Semiochemicals of Bark Beetles: Results from Field Tests (Gary Daterman, USFS) [Baron]

(D) Choristoneura Distribution and Taxonomy, Part II (George Harvey, Forestry Canada) [Cascade South]

5:30pm - 7:00pm No-host Mixer [West deck]

7:00pm - 9:00pm Bar-B-Que and Entertainment [Pavilion]

Friday, September 15

8:30am - 10:00am Panel: Bark Beetle - Pathogen Interactions in Coniferous Forests [Mountain/Summit/Cascade]
Moderators: Tim Schowalter (OSU) and Greg Filip (USFS-PNW)
Panel Members: Peter Loria (USFS-SO)
Everett Hansen (OSU)
Terry Shaw (USFS-RM)

10:00am - 10:30am Break

10:30am - 12:00pm Final Business Meetings (WFIWC: Summit; WIFDWC: Cascade)

WIFDWC/WFIWC FIELD TRIP SCHEDULE
(September 13, 1989)

Pest Management and Pine Silviculture

TIME	MAP REFERENCE #	TOUR STOPS
8:00 am	1	Depart Inn of Seventh Mountain
8:10 - 8:50 am	2	Western Pine Shoot Borer

Discussion Leaders

Bus #1 (blue)	C. Sartwell
Bus #2 (red)	L. Sower
Bus #3 (yellow)	G. Daterman
*Bus #4	

9:12 - 10:20 am	3	Pandora Moth and Ponderosa Pine Silviculture

Discussion Leaders

	Pandora Moth	Silviculture
Bus #1 (blue)	M. Wagner	USFS Ft.Rock Ranger Dist
Bus #2 (red)	J. Schmid	" "
Bus #3 (yellow)	D. Bennett	" "
*Bus #4		

11:00 - 11:55 am	4	Lodgpole Pine Thinning Demonstration for Mountain Pine Beetle Control

Discussion Leaders

Bus #1 (blue)	R. Schmitz
Bus #2 (red)	M. McGregor
Bus #3 (yellow)	G. Amman
*Bus #4	

12:00 - 1:00 pm	5	LaPine State Park Day Use Area Lunch with concurrent demonstration of techniques for collecting volatile emissions from trees. Demonstration leader - D. Rhoades

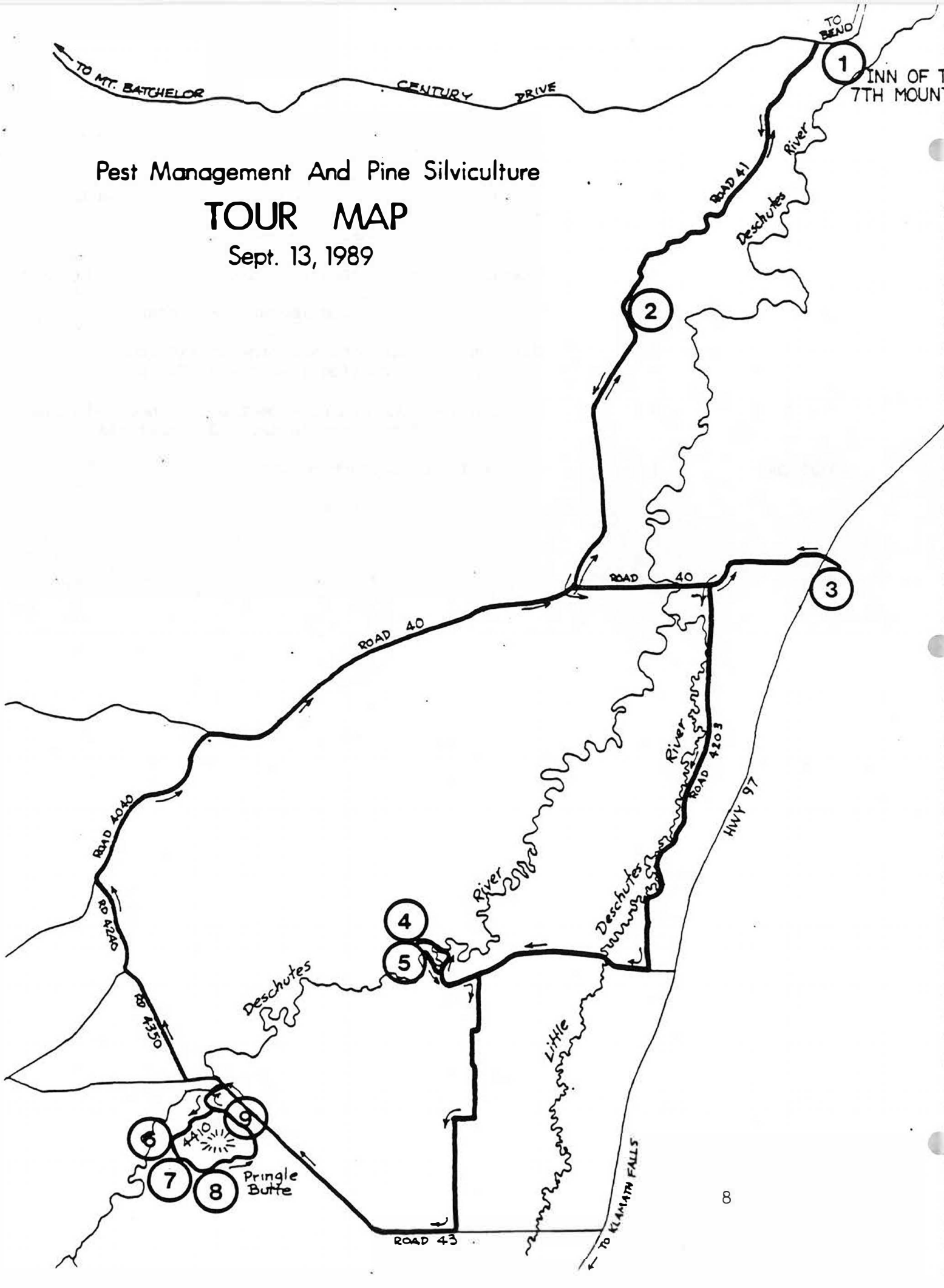
* During the morning tour stops, people on bus #4 need to disperse among the discussion groups for buses 1-3.

1:30 - 4:40 pm		Buses rotate among 4 stations at the Pringle Falls Research Area.
	6	Station 1 - Mistletoe dynamics and ponderosa pine silviculture. Discussion leader - L. Roth
	7	Station 2 - Resistance to dwarf mistletoe: How do we use it? Discussion leader - R. Scharpf
	8	Station 3 - Root rots and pine silviculture Discussion leader - G. Filip
	9	Station 4 - Mountain pine beetle in 5-needled pines. Discussion leader - J. Robertson
5:35 pm	1	Arrive Inn of Seventh Mountain

Pest Management And Pine Silviculture

TOUR MAP

Sept. 13, 1989



PROCEEDINGS

FORTIETH ANNUAL WESTERN FOREST INSECT WORK CONFERENCE

BEND, OREGON

SEPTEMBER 11 - 15, 1989

Executive Committee (Fortieth WFIWC)

John Wenz	Chairman
Dick Schmitz	Immediate Past Chairman
Ladd Livingston	Secretary/Treasurer
Tim Paine	Councilor
Chris Niwa	Councilor
Terry Shore	Councilor

WESTERN FOREST INSECT WORK CONFERENCE

40TH ANNUAL MEETING
BEND, OREGON

11 SEPTEMBER 89 EXECUTIVE COMMITTEE MEETING

Present : John Wenz, Chairman
Dick Schmitz, Immediate Past Chairman
Ladd Livingston, Secretary/Treasurer
Torolf Torgerson, Common Names Committee Chairman
Dave Wood, Chairman of Committee to study declining support for Forestry Entomology.
Tim Paine, Councilor
Russ Mitchell, Program
Kathy Sheehan, Program

Chairperson Wenz called the meeting to order.

1. **Minutes of the 1988 Executive Committee Meeting**

Chairman Wenz proposed to dispense with the reading of the minutes unless objection.

Approved.

2. **Treasurer's Report**

Checking	$ 790.87
Certificate	5,348.15
	$ 6,139.04

Discussion on use of these funds: May need some for field trip buses, or may use registration funds designated for proceedings for the buses. If so, we would have to use current funds for the proceedings. In the future we hope to have the sponsoring agency/unit pay for publication costs. If there is any overage at the end of the 1989 meeting, it will be split with the Pathology group according to registration.

3. **1989 Meeting Information Update**

Brief review by Russ Mitchell

4. **Future Meetings.**

a) Brief update by Ladd Livingston for the March 5-9, 1990 meeting in Coeur d'Alene, ID.

b) The National Forest Insect Work Conference meeting is scheduled for March 25-27, 1991 at the Radison Hotel, Denver.
Steering Committee meeting, Sept. 24, 1989, in Spokane. This will be concurrent with Western Forest meeting.

Question: will we have our own WFIWC meeting?
Answer: 4 groups would be combined:
WFIWC
Southern Forest Insect Work Conference
NE Forest Insect Work Conference
N Central Forest Pest Work Conference
We Need to decide if we will also have a separate 1991 meeting.

c) The location for 1992 meeting needs to be decided. It will probably be California.

5. Committee Reports/Action

a) Future of Forest Entomology, Report by Dave Wood

A committee has been appointed with Dave Wood as Chairman. The primary goal is to gain support for forest insect and disease research. On Feb. 15, 1989 a group of interested entomologists and pathologists met in Denver to discuss this subject. From that meeting a council was formed. It is called the National Council on Forest Health Issues. Dave Wood represented the WFIWC. Wood reported that the National Academy of Science has solicited and received letters of concern from Forestry Interest groups relative to the need for support for biological sciences. Chairman John Wenz sent a response last year. From these responses the Academy has prepared a draft report and is now asking for letters of support.

The NCFHI group conducted the following business:
1. By-laws were formed (Appendix 1).
2. They are asking for representation from Pest Action Councils, Pest Working Groups, etc.
3. Dave Wood was appointed chairperson of the National Council.
4. A letter of support was sent to the NAS.

A resolution was prepared, as follows, in support of the NCFHI. It will be presented to the members in the initial business meeting.

Be it resolved that the WFIWC:

Endorses the general principles embodied in the proposed constitution and by-laws of the National Council on Forest Health Issues and directs the Executive Committee to appoint two individuals to represent the WFIWC at the meetings of the NCFHI.

Dave suggested WFIWC appoint representatives.
Suggestions for reps:
1. Dave Wood - serving as chairman, appropriate.
2. Current Chairman.

b) Honor/Merit Awards, Report by Dick Schmitz

Dick has prepared a questionnaire (Appendix 2) to survey the feelings of the group as to whether we should have a special recognition award. It

is based on current guidelines being used by the Southern Forest Insect Work Conference (Appendix 3). The questionnaire is to be summarized for Friday. A decision will be made at that time.

c) History Committee - No Report.

d) Common Names Committee

Torgy named the members:

Torolf Torgerson, Chairman	John Moser (SFIWC rep.)
Charles Sartwell	Larry Stipe
Robert Stevens	Iral Ragenovich
Judith Pasek	

4 Common Names are being worked on:

1. Ponderosa pine cone worm	3. Western conifer seed bug
2. Ponderosa pine tip moth	4. Western pine tip moth

e) Nominating Committee

Need to replace Secretary/Treasurer.

6. Resolutions

None known at this time.

7. Other Business

a) Tributes

1. Paul Tilden is the only member known to have passed away at this time.

b) Secretary/Treasurer Proposal : separate into two offices. Make an indefinite appointment for Treasurer. This requires Amendments to the Constitution of the WFIWC. A draft copy of suggested changes will be prepared and made available to the members for review.

c) We have had trouble with the mailing list. Proposal: The Secretary position will maintain the mailing list. Add a box to the registration questionnaire sent out asking if people want to be maintained on the list. If they don't respond or don't come to a meeting, then the name will be removed.

d) Preparation of the 1989 Proceedings - Summaries are to be sent to Bob James.

Other discussion - Photos are to be taken prior to lunch on Tuesday. Alan Kanaski arranged.

Meeting adjourned.

WESTERN FOREST INSECT WORK CONFERENCE

40TH ANNUAL MEETING
BEND, OREGON

12 SEPTEMBER 89 INITIAL BUSINESS MEETING

Chairman Wenz called the meeting to order.

1. **Introductions of new members.**

   Jed Dewey, USFS. Supervisory Entomologist Region 1 introduced Bill Antrobius, a recently hired entomologist with Forest Pest Management in Missoula, Montana.

2. **Tributes to members who have passed away.**

   Paul Tilden passed away on August 20, 1989. He had retired 2 years ago from the Pacific Southwest Forest and Range Experimental Station where he was a research entomologist. He worked extensively with Western bark beetles.

3. **Minutes of 1988 Meeting.**

   Chairman Wenz proposed suspending reading of the minutes since they have been published in the proceedings.

   Approved.

4. **Secretary/Treasurer's Report.**

   Funds on hand at this time, exclusive of registration for the 1989 meeting:

$ 790.87	Checking
5,348.15	Certificate
$ 6,139.04	Total

5. **Future Meetings.**

   a) 1990 Meeting, Coeur d'Alene, March 5 - 8. Presentation by Jed Dewey. A proposed agenda was distributed (Appendix 4) with a request for comments by 15 Oct. 89. Discussed souvenir options for the 1990 meeting.
      1. USFS type belt buckles (or other) - $ 14.50 each if have over 50 orders. The final decision is to be left up to the local arrangements committee.

   b) A proposal was made that in 1991, we would participate in a National Meeting , combining the Western Forest Insect Work Conference, the Southern Forest Insect Work Conference, the Northeastern Forest Insect Work Conference, and the North Central Forest Pest Work Conference. The meeting would be held March 25-27, in Denver, Colorado.

      On September 24, 1989, there will be a meeting in Spokane in conjunction with meeting of Soc. of Am. For. to discuss initial details.

Suggestion for participants to represent our group:
Skeeter Werner
Mary Ellen Dix with
Ann Lynch as an alternate

c) California was proposed as the site for the 1992 meeting. The suggestion was made to consider the Redding area.

5. **Committee Reports/Action**

a) On the issue of support for Forest Entomology, there have been 2 years of debate.

In 1988 a committee was appointed with Dave Wood as Chairman. Members:

Dave Wood	Dave Holland
Garland Mason	Gordon Miller
John Laut	

Dave Wood has attended a Denver Meeting with representatives from various work conferences, both Entomologists and Pathologists, who have similar concerns and interests in promoting the advancement of support for forest Entomology and Pathology. The group formed a new ad hoc committee, or council as it has been named. The proposed name is the National Council of Forest Health Issues. A draft constitution and by-laws will be made available for review during the conference (Appendix 1).

A resolution, as follows, was presented suggesting that the WFIWC support the NCFHI and appoint two representatives from the WFIWC.

Be it resolved that the WFIWC:

Endorses the general principles embodied in the proposed constitution and by-laws of the National Council on Forest Health Issues and directs the Executive Committee to appoint two individuals to represent the WFIWC at the meetings of the NCFHI.

The first activity of the National Council was to send a letter of support to a National Academy of Science group who is preparing a report on the issue of support for biological sciences.

Comments:

Alan Cameron suggested adding ESA certification to the resolution. Dave Wood commented that we need a vehicle for national coordination to take advantage of opportunities as they arise. This Council will provide this vehicle.

b) Honor Merit/Awards, Dick Schmitz, Chairman.

Dick Schmitz reviewed the history of the idea including a plea by Bob Colson from the SFIWC. Dick explained his questionnaire (appendix) and background paper. Everybody needs to fill it out and return it.

c) History, Ron Stark and Malcolm Furniss Co-Chairmen.

No report.

d) Common Names Committee, Torolf Torgerson, Chairman.
Committee Report:

Members : Torolf Torgerson, Chairman
Charles Sartwell
Robert Stevens
Judith Pasek
John Moser (SFIWC representative)
Larry Stipe
Iral Ragenovich

Membership change - John Moser will step down from his post on January 1, 1990. The Committee invites nominations for a member to fill Moser's vacated post.

Actions - Within the last calendar year we have approved and submitted to the Committee on Common Names of the Entomological Society of America, three common names: ponderosa pine coneworm for Dioryctria auranticella; western conifer-seed bug for Leptoglossus occidentallis; and western pine tip moth for Rhyaciania bushnelli. These names have been approved by the ESA Committee, but will not become final until publishing of the names in the ESA Bulletin, and passing a waiting period of 30 days without dissent.

The Committee has approved ponderosa pine tip moth for Rhyacionia zozana; this name will be submitted to the ESA Committee for approval before the 1990 WFIWC.

Respectfully submitted,

(Signed) Torolf R. Torgersen, Chairman

Mel McNight is working on a Hopkins indexing system in Washington, DC. He has 163,000 records in 22 units. Mel has started entering these records into a computer program that he designed - HUSSI (Hopkins U.S. System Index). Torgersen will discuss at further length with interested parties.

6. **New Business.**

a) The proposal was made to separate the office of Secretary/Treasurer into two separate offices. This will require changes to Section 3 Article 4 of the bylaws. A proposal (Appendix 5) will be posted for review by the members during the conference.

b) Updating the Mailing List

Executive Committee Proposal: Add a box to the registration form asking if people want to be maintained on the mailing list. If a person doesn't respond or doesn't attend a meeting for three years their name will be removed from the mailing list. We also need to provide the option for people who cannot attend to receive the proceedings for a fee.
Suggestion: Put notice at top of announcements in big letters rather than at the bottom.

No other business.

Meeting adjourned.

WESTERN FOREST INSECT WORK CONFERENCE

40TH ANNUAL MEETING
BEND, OREGON

15 SEPTEMBER 89 FINAL BUSINESS MEETING

Chairman Wenz called the meeting to order.

1. Minutes of the Initial Business meeting.

   Minutes were read and approved.

2. Tributes - John Wenz.

   During the conference, I have been made aware of the passing of 3 additional members of the work conference:

   a) Mr. Hector (Hec) Richmond passed away at the age of 86. Hec was the head of the then-called Victoria Lab for many years and conducted research on the MPB/WPB. He is of special significance to the WFIWC as he was one of the four original founders of the conference who, in 1949 along with Bob Furniss, Paul Keen and Jim Evenden formulated what ultimately became the constitution for the first WFIWC in 1950.

   b) Dr. L.H. (Leo) McMullen died last month after a short illness. Leo was a research entomologist with the Canadian Forestry Service (now Forestry Canada) at the Pacific Forestry Center in Victoria. Leo's research involved the DFB, MPB and the white pine/silka spruce weevil.

   c) Ray Lejeune - Retired Canadian. Long time Regional Director - General for the Victoria Lab - Forestry Canada. Spent last few years of career in advisory capacity in Othawa.

   All three will be missed.

3. Resolutions - Torolf Torgersen

   <u>Thanks to organizers:</u>

   Be it resolved that the membership of the WFIWC recognizes and thanks the organizers of this combined Disease and Insect Work Conference. These people have given of their time, energy, and professional expertise and commitment to provide for us an interesting and challenging series of panels, workshops, and field trips.

   In particular, for leading the efforts to hold this combined meeting, we thank Donald Goheen and John Wenz, Chairmen of the respective conferences.

   For overall program leadership - Boyd Wickman, Katherine Sheehan, Ellen Michaels-Goheen and Everett Hansen.

   For local arrangements - Alan Kanaski and Russell Mitchell.

For ladies program arrangements - Evelyn Mitchell.

For organizing workshops and maintaining liaison between Disease and Insect program committees - Ellen Michaels-Goheen and Kathy Sheehan.

For organizing and moderating panels - Greg Filip, Everett Hansen, Marge Palmer, Tim Showalter and Mike Wagner.

For planning and directing all the details for the superb field trips - Donald Goheen, Ellen Michaels-Goheen, and Dave Overhulzer.

We recognize the contribution of panel speakers, workshop moderators and participants, and the many people who helped move equipment, lunches and drinks; who sent out notices, who marked roads and field discussion sites, and who picked up our leavings.

And, we thank the staff and management of the Inn at the Seventh Mountain for luncheon and banquet arrangements, and for their helpful and courteous service.

Moved and seconded; Unanimous affirmative vote.

4. **Business Items - John Wenz**

a) National Council on Forest Health Issues. The proposed resolution, below, was read:

> Be it resolved that the Western Forest Insect Work Conference
>
> > Endorses the general principles embodied in the proposed constitution and by-laws of the National Council on Forest Health Issues and directs the Executive Committee to appoint two individuals to represent the WFIWC at the meetings of the NCFHI.

Moved and seconded; Passed with one negative vote.

b) Separate office of Secretary/Treasurer into two.

Resolution read by Chairman Wenz.
Proposed : To separate the office of Secretary - Treasurer into two (2) offices: Secretary and Treasurer, as follows:

> A secretary to act for a period of two (2) meetings, whose duties shall be to keep a record of Executive Actions, record minutes of Executive Committee and conference business meetings, to maintain committee correspondence, and to send out notices, reports and proceedings. The Secretary is charged with the responsibilities of coordinating preparation of the proceedings.
>
> A treasurer, who is a non-voting member of the Executive Committee, to act for an indefinite term, whose duties shall be to keep a record of funds collected and disbursed, to issue monies for approved purposes, to maintain a record of members, committees, and officers, and to provide

mailing lists and/or labels as needed. The Treasurer will provide financial records for inspection by a two-member Executive audit team, comprised of the Chairman and Immediate Past Chairman annually prior to the Executive Committee meeting.

Motion moved and seconded. Vote was unanimous.

5. Committee Reports

1) Honor/Merit Awards, Dick Schmitz, Chairman: 33 questionnaires were returned. 32 were in favor, 1 was against. All liked using the SFIWC format. Several names were suggested - no consensus was reached at the moment.

A resolution was proposed by Dick Schmitz that the:

> WFIWC establish a 5 person Awards Committee for the purpose of recognizing individuals who have made outstanding contributions to western forest entomology. The award to be presented only in years when a majority of the committee members are in concurrence. Criteria for eligibility of nominators and nominees as well as nomination procedures will be those currently in effect for the A.D. Hopkins Award conferred by the SFIWC. Further the WFIWC award be named the Richmond-Keen Award to honor these two outstanding forest entomologists and founders of the WFIWC.

There was discussion of an appropriate name. Suggested that the name be changed to Founders Award.

Moved that the resolution be accepted with the suggested name change - vote was unanimous.

2) Nominations Committee, Dick Schmitz, Chairman.

Nominations proposed were as follows:

a) WFIWC representatives to national FIWC planning session in conjunction with SAF meeting Spokane, September 24, 1989:
Skeeter Werner
Mary Ellen Dix
Ann Lynch - Alternate

b) WFIWC representatives for National Council on Forest Health Issues:
Dave Wood
Current Chair WFIWC - Wenz

c) WFIWC Secretary :
Kathy Sheehan (2 year term)

d) WFIWC Treasurer :
Ladd Livingston (Indefinite term)

e) WFIWC Counsellor :
Renee Alfaro (3 year term)

f) WFIWC Awards Committee Chair :
John Schmid (1 year term. Assumes chair for year following.)

Nominations, as read were moved and seconded. The vote was unanimous.

6. Future Meetings

Discussion of the 1991 meeting was most appropriately left until 1990 meeting in Coeur d'Alene.

Discussion: time of year not mandated by by-laws. Changing the time of year will open up other areas for opportunities.

Treasurer is charged with determining an average fixed cost to use as a base for estimating future needs.

7. Other Business

Leroy Kline suggested we initiate reduced registration fee for retirees and students. Directed to take this into consideration.

Peter Lorio - SFIWC: The next meeting will be in Arkansas, August 1990. Invited participants.

Meeting adjourned.

BUSINESS MEETINGS MINUTES
WESTERN INTERNATIONAL FOREST DISEASE WORK CONFERENCE

First Meeting - Sept. 12, 1989

This meeting was called to order by Chairperson Don Goheen.

It was announced that Melissa Marosy would be the interim program chairman for the 1990 meeting.

OLD BUSINESS

Ken Russell stated that last year's Proceedings were finished and would be distributed during this year's meeting. They were printed for about $800-900, which is significantly less than the average cost of past Proceedings.

Ken Russell stated that the WIFDWC account balance as of June 30, 1989 was $1592.17. From this amount a $250. deposit for the current meeting and the cost of printing the 1988 Proceedings must be deducted.

Committee Reports

The Disease Control Committee had no report and will not meet this year due to the joint nature of the meeting with the entomologists.
The Rust Committee plans to meet at the IUFRO Conference in Banff (this year).
The Root Disease and Dwarf Mistletoe Committees had no report and do not plan to meet this year.

The committee assigned to input WIFDWC concerns on the future of forest pathology (National Forest Health Issues) did not meet this past year.

NEW BUSINESS

Rich Hunt proposed that WIFDWC meet jointly with the Western Forest Genetisits in 1991 in Vernon, B. C. The meeting would be during the first or second week of August. It is possible that the meeting could start in one location and proceed to another.

Terry Shaw reported on the APS meeting concerning the future of forest pathology. Dave French had a draft report from the National Academy of Sciences describing the status of forestry research. The report requests an additional $100 million/yr. for forestry-related research. In addition, it states that all of Agriculture needs about $500 million/yr. for research. The President of APS will send a letter to the President of the SAF concerning lack of training of foresters in forest biology. It also will suggest that plant pathologists serve on accredition committees for forestry schools. The APS committee also discussed strategies about the next steps to take.

Al Funk will be retiring in February, 1990. Dr. Brenda Callum will replace Funk.

Neil Martin has retired from the USDA Forest Service Intermountain Research Station in Moscow, Idaho.

Bill Bloomberg plans to retire this fall. He had a serious operation, but has recovered.

Walt Thies announced that Scientist and Technician positions will be filled at the Corvallis lab shortly.

Ken Russell announced that a conference about "Special Forest Products" will be held at the Red Lion in Portland, Oregon Feb. 8-10. 1990. The conference will deal with fungi, mushrooms, wood products, edibles, etc. It is being sponsored by several Pacific Northwest forestry organizations.

Fred Baker announced an silvicultural short course for non-silviculturists at Utah State University. Contact Fred for more information.

Walt Thies announced occurrence of tours at the end of WIFDWC including the Corvallis lab on friday and laminated root disease on saturday.

Jack Sutherland announced the IUFRO Conference on nursery diseases to be held next August (1990) in Victoria, B. C.

Proposed meeting sites for WIFDWC:

Bill Jacobi proposed southwestern Colorado (Durango) near the San Juan Mountains.

Rich Hunt proposed Vernon, B. C. in conjunction with Western Forest Genetics Conference.

Chairperson Goheen adjourned the meeting.

Second Meeting - September 15, 1989

The meeting was called to order by chariperson Don Goheen.

OLD BUSINESS

John Muir announced that two new forest pathologists were on the staff of the B. C. Ministry of Forests: Richard Reese and Stefan Zeglan.

Terry Shaw announced the current status on the publication on common names. Frank Hawksworth and Hal Burdsall will have a national list of common names and synonyms distributed for comment this coming winter.

Harold Offord (HLM) sent a $25. check to WIFDWC to help defray costs of publishing our 1989 Proceedings. The secretary will prepare a thank you letter for the donation.

Bob James gave an interim financial report that had been prepared by Ken Russell, who was unable to attend this business meeting. The report indicated a bank balance of $1592.17 as of June 30th. From this amount, the costs of

printing the 1988 Proceedings must be deducted (about $900.). Ken Russell has sold $91. worth of Proceedings during this meeting and $61. worth of previous year's Proceedings.

NEW BUSINESS

John Muir announced the occurrence of a new non-refereed journal starting soon. The journal will specialize in brief reports on disease surveys and diagnoses. It is geared toward rapid publication of this type of material.

Fields Cobb discussed recent discussions of the Forest Pathology Committee of APS. In particular, he focused on the National Council for Forest Health Issues. He requested that an alternate be appointed by WIFDWC (when chairperson John Laut could not participate). [This alternate was designated by chairperson Don Goheen to be Bob Edmonds]. Fields stressed that a coordinated response to the National Resource Council Report was needed. He said the current report has very little to do will pest isssues. Dick Parmeter stated that the purpose of WIFDWC in this action was to sell our profession.

Jim Stewart will be providing Dave French some figures for inclusion in this report.

Current WIFDWC members who are assigned to coordinate WIFDWC responses to these issues are: John Laut (chairperson), Bob Edmonds (alternate), Fred Baker, Dick Smith, and Gregg DeNitto. Bill Jacobi recommended electing a new chairperson, since John Laut was currently out of the mainstream of forest pathology.

Terry Shaw made a motion that the chairperson of this committee should call a meeting of its members and provide a report of their discussions to the next WIFDWC. The motion was passed.

Bob James discussed a number of items, such as the 1989 Proceedings (to be compiled jointly with the Western Forest Insect Workshop), the updated mailing list, and a poll regarding items for the 1990 meeting to be held in Redding. The Redding meeting will be held Sept. 18-21, 1990.

Rich Hunt proposed that the 1991 meeting of WIFDWC be held in Vernon, B. C. during the beginning of August with the Western Forest Genetics Association. Discussions centered around how to integrate the meeting for both groups and that the meeting should be confined to one location for logistical reasons. Terry Shaw made a motion that the membership adopt this location for the 1991 meeting; it was seconded and passed.

Bill Jacobi proposed that the 1992 meeting of WIFDWC be held in Durango, Colorado (to be cosponsored by the Rocky Mountain Research Station, Forest Pest Management, and Colorado State University). Fields Cobb made a motion that the membership adopt this location for the 1992 meeting; it was seconded and passed.

Interim program chairperson Melissa Marosy announced that she had received two suggestions for the 1990 WIFDWC: a field trip to McLeod Flats and panels on black stain root disease and habitat relations to disease.

Bob James (with the assistance of Fields Cobb) nominated for officers of the 1990 WIFDWC: chairperson - Rich Hunt; secretary - Jim Hoffman. The nominations were immediately closed and these officers were unanimously elected.

Walt Thies proposed that honorary life members be sent a questionaire regarding their activities so that members of WIFDWC could be kept informed. This will be done by this year's secretary and reported during the next meeting.

Chairperson Don Goheen adjourned the meeting.

Treasurer's Report, 37th WIFDWC

Balance on hand at close of thirty-sixth meeting.	($U.S.)	(79.43)
Adjustment for 1988 (36th) proceedings cost		547.08
(Original estimate was $1300.00; actual cost was $752.92		
Interest paid July 1, 1988 through June 30, 1989		84.60
Miscellaneous proceedings sales (27) from 1/1/89 to 12/31/89		217.00
Special contribution from Harold Offord		25.00
Sub-total		794.25

Thirty-seventh WIFDWC statement from Bend meeting

Participants:
Combined total-entomologists and pathologists 280

Note: Meeting expenses were handled independently by the arrangements committee. Money left over was split equally with WIFDWC/WFIWC

Net Receipts:	3334.33
Proceedings printing estimate for 165 copies	1500.00
Sub total:	
Balance at close of thirty-seventh meeting	2628.58

*** Rainy day note**: For years our credit union carry-over account balance has averaged about $1000 to cover next year meeting deposits, etc. The Park City meeting treasurer's report showed a proceedings cost estimate of $1300.00 which when adjusted to the actual cost of $752.92 gave a comfortable profit of $467.65 thanks to the efforts of Bart Van der Camp and the University of British Columbia (see adjustment entry above and p. 126 of previous proceedings). The Bend meeting surplus added more than $1500 to the account coffers. Adjustment will be made when the Bend meeting proceedings are paid for. The surplus resulted from charges for buses and the facilities at the Inn of the Seventh Mountain being lower than originally budgeted.

I held off paying two bills (USU facility deposit of $250 and the Park City meeting proceedings $752.92) until our financial condition improved. I recommend we work the carry-over balance back down to about $1500. We are still self sustaining.

Account 936258, Washington State Employee's Credit Union. PO Box WSECU, Olympia, WA 98507. Phone (206) 943-7911. Official signatures for withdrawing funds are Walt Thies, Ken Russell and Fields Cobb.

Ken Russell, Treasurer, January 16, 1990.

Chairperson's Address

40th Annual Meeting Of The
Western Forest Insect Work Conference
Held Jointly With The
Western International Forest Disease Work Conference

September 12, 1989
Bend, Oregon

As most of you are aware by now, this is the 40th meeting for the granddaddy of the western work conferences, the Western Forest Insect Work Conference and the first joint meeting with our Pathology counterparts in 14 years. The last combined meeting was in February, 1975, in Monterey, CA. During discussions at last year's Western Forest Insect Work Conference, held in Flagstaff, AZ., on the opportunity for a joint conference, a few recalcitrant members suggested (facetiously, I think) that even a 14-year hiatus was not nearly long enough, but most members felt it to be high time and most appropriate to accept the invitation of the Western International Forest Disease Work Conference and meet together again this year in Bend.

From an entomological perspective, the past year and a half or so has been fairly typical, with the occurrence of several highly visible problem situations. Gypsy moth continued its perhaps inexorable attempt to become established in new areas. Two eradication projects were conducted in 1989 against the gypsy moth, one over about 1,100 acres in the Coeur d'Alene-Sandpoint area in Idaho and another covering about 3,600 acres near Salt Lake City. Survey trap catches to date in California indicated that gypsy moth may be seriously trying to set up shop again in several areas, including Marin County, already infested with hot tubs and yuppies, and in the vicinity of San Diego. Another western defoliator, the Douglas-fir tussock moth, continued to be a nuisance in northern California where about 84,000 acres were sprayed with Bacillus thuringiensis (Bt) on the Plumas and Lassen National Forest's and intermingled private holdings. In addition, about 12,000 acres were sprayed, again with Bt, in Oregon against the Western spruce budworm.

However, perhaps the most widespread problem in the West has been drought-bark beetle related mortality. This has affected forested lands from Idaho to California and has involved several bark beetles and timber types. The beetles include the western pine beetle, the mountain pine beetle, red turpentine beetle, as well as the pine and fir engravers. Even Phleosinus beetles in incense cedar have received some attention. Damage has involved several different coniferous hosts, including ponderosa, Jeffrey, sugar and lodgepole pines, white, red, and grand firs, and incense cedar, and has ranged from the lower elevation pine type through mid-elevation mixed conifer stands to true fir and lodgepole pine habitats. Dealing with this situation, responding to requests for information and assistance from individual property owners, industry, State, local government and Federal land managers, has surfaced, once again, issues central to this joint Work Conference.

One of these issues is complexity. A frequently voiced perception is that we are currently faced with a "bark beetle" problem and the only relevant question is how to control the "bark beetle". A recent headline in the Metro section of the Sunday San Francisco Examiner proclaiming "Insects Chewing State Forests at Alarming Rate" is fairly typical of the media coverage. Certainly, the situation is much more complicated and involves interactions among the various host trees and the bark beetles, their symbiotic fungi and natural enemies, varying degrees of drought stress and other predisposing

factors including site and stand conditions, root diseases, dwarf mistletoes and resource management activities or, in some cases, inactivity. It has been recognized before, but again, the underlying causes as well as potential short- and long-term management solutions, involve many complex interactions.

The reality of the complexity of forest resource management and forest protection does not obviate at times, the social, political and often, biological need for direct suppression of a single pest and the need for continuing research on suppression techniques and methodologies. It will be of considerable interest to hear the discussion of recent research using bark beetle semiochemicals in workshops later in the Conference. Insect suppression tends to be directed toward problems that are widespread and, to some extent, already out of control and there are situations that exceed our current ability for timely, effective suppression.

It may be beneficial to consider more frequently opportunities to utilize suppression methodologies on low-level, endemic, populations in conjunction with the implementation of stand hazard rating systems, early warning techniques (such as being implemented for the DFTM), and silvicultural treatments that include insect and disease considerations. Resource management that results in healthy, vigorously growing stands does not necessarily preclude the occurrence of pest problems, but does create conditions most advantageous for the effective, timely, implementation of pest management treatments when needed.

Prevention of unacceptable resource damage and impact is a reasonable long-term goal for forest protection in general and insect and disease management in particular. This implicitly recognizes that pest management be considered, as it increasingly is, an integral part of forest resource planning and management. This is certainly not a new concept and, in fact, was a central theme of the last joint work conference in 1975. It requires a commitment to technology transfer and a close working relationship between research and pest management specialists as well as with resource specialists in other disciplines. Some progress has been made in this area with cooperative research efforts and the increased inclusion of pest management specialists on interdisciplinary teams involved in forest resource management plans to site specific projects and prescription. We will be able to see examples of this during the field trips planned over the next couple of days. These opportunities may be enhanced through recent moves by Forest Pest Management in Region's 2,3,5 and 6 to create zones, field offices or shared service areas to place insect and disease specialists in closer proximity to field level resource managers.

Another area of improvement/progress since we last met together 14 years ago is in modeling pest population dynamics and impact. A recent example is the Western Root Disease Model that attempts to include some bark beetle interactions. Outputs from models should be interpreted with caution pending calibration and validation. Emphasis on land management plans for the National Forests has highlighted, among other things, the need for quantitative integration of pest damage/impact considerations in the resource management planning process. Advances have been made, but more progress is needed in modeling pest damage and impacts that better reflect insect-disease-host interactions in ways that are compatible with forest resource planning processes. Another related problem is the need to develop better ways to quantify and display values/benefits from pest managements activities, particularly where non-commodity forest resources are involved.

Improvements in modeling and pest management strategies are dependent to a large extent of an increased understanding of the biological and ecological bases underlying the pest-host systems involved. Progress has been made in better understanding insect-disease

interactions including a)bark beetle-fungal symbionts-host condition/response relationships, b) insect-root disease-dwarf mistletoe interactions and c) insects as vectors of root disease pathogens. These topics will receive ample coverage throughout the conference. Continued progress will require adequate funding and professional support for research and, as noted in the "Forest Health Through Silviculture and IPM Strategies Planning" document, the development and maintenance of a realistic balance between short-term commodity-oriented suppression projects and long-term investments in prevention and research.

A final point is the increasing importance of public and special interest group perceptions, expectations and interest in multiple-use forest resource management in general and forest protection specifically. The old-growth spotted owl situation currently illustrates how public and special interest groups can participate in the overall forest resource management decision-making process. Public perceptions and interests can also have an influence on levels of support for forest research and management activities. There is an obvious increasing need for public involvement in planning and developing forest and pest management-related activities to at least try and reach a common understanding of forest resource management and forest protection direction and needs.

Several years ago I attended a joint Pathology/Entomology work conference in another part of the country. We met in a common facility for the formal daytime sessions but at the close of the day, the pathologists went to their motel on one side of town, the entomologists to theirs on the opposite side of town. I don't know if there was a message there or not, but in any case, the local arrangements committee (Russ Mitchell, Alan Kanaski) has removed this symbolic barrier to interaction here in Bend. The job done by the Program Committee including Katharine Sheehan, Boyd Wickman, Ellen Michaels Goheen and Everett Hansen speaks for itself. The only problem is how to be in more than one workshop/field trip at the same time. There is every opportunity to make this a productive and worthwhile conference.

John M. Wenz
Chairperson

CHAIRMAN'S WELCOME

Welcome to Central Oregon and the 1989 joint WIFDWC/WIDWC meeting! We pathologists and entomologists really don't get together like this often enough. I attended the last joint meeting of our two organizations as a graduate student, and I KNOW that that was a long time ago! Working as we do with such interrelated problems I'm convinced that we should meet together more frequently than once every 15 years. We have a lot to talk about.

One thing that I can assure you of- this year's meeting will be a work conference in the full sense of the word. Even a glance at the schedule will show you that an awful lot has been planned. I urge you to get involved and participate! Our week should be interesting, thought provoking, and hopefully very stimulating. I would like to thank all of the folks who are responsible for this year's program especially Boyd Wickman and Everett Hansen program chairmen, Russ Mitchell and Alan Kanaski of the local arrangements committee, and Kathy Sheehan and Ellen Michaels Goheen who didn't have any official titles but assumed responsibility for organizing the innumerable workshops that we will soon be involved in and took care of the meeting announcements and mailings. All of these folks and others as well worked extremely hard and put a lot of time and effort into preparation. I know from the many phone calls I received this summer that putting this meeting together was a top priority for those involved. I also know from personal experience.... For a while I was a little worried about Ellen. She was having recurrent dreams in which she continuously put together workshops on esoteric aspects of disease/insect interactions and recently she had a nightmare in which she had to give the chairman's welcoming address!

In preparation for this meeting, I spoke with John Wenz, chairman of WFIWC, about how long our welcoming addresses should be and what we should say. He gave me excellent advice suggesting that we dispense with welcoming speeches altogether and further advising me that if we were forced to say something to keep it extremely short. It is customary, however, for WIFDWC chairmen to pontificate. How could I hold up my head in the presence of such illustrious former chairmen as Dick Parmeter, Ed Wicker, and Fields Cobb if I didn't say a few words about what I thought concerning the future and the challenges facing our science?! I'll try to be briefer than they would be.

I've been working for Forest Pest Management, the extension pest management organization of the USDA Forest Service, in the Pacific Northwest Region for the last 14 years. During that time, I have observed an increase in awareness and interest in forest insects and diseases among practicing foresters that can only be described as tremendous. We could employ 3 or 4 times as many entomologists and pathologists as we now do and still not respond to all of the requests we get for assistance. Most other extension groups that I know of could, too. Excellent pest management is being practiced in some stands. The problem is that it is being done in a piece-meal fashion frequently using inadequately researched information and without adequate record keeping. From my perspective, the major challenge of the future is to insure that appropriate, quality pest management be integrated into ALL silvicultural prescriptions and vegetation management plans or at the very least that it always be properly considered. If I were ruler of the world, or at least the natural resource kingdom, for a day there are several areas that I would try to strengthen for the future:

(1) Continuing and accelerating insect and disease training for future foresters, practicing foresters, other resource specialists,line officers, and the public. We are doing a good job of reaching many foresters especially silviculturists with pest training today, but we shouldn't rest on our laurels. Unless other resource specialists and higher level managers such as District Rangers become more knowledgeable and concerned about forest pests, insects and diseases will never receive the consideration that they deserve in the big picture. Furthermore, We have an obligation to educate our publics concerning forest pest ramifications. No issue illustrates this better than the current challenge we face to comply with the public's desire to manage some substantial forest areas using only uneven-age silvicultural systems. Finally, it is inconceivable to me that students can graduate from reputable forestry schools without classwork in forest entomology or pathology. That is wrong.

(2) A greater commitment to considering the effects and management implications of pests on resources other than timber production, especially recreation, wildlife, and visuals. Insects and diseases have major impacts on these resources, and we can have a strong role in their proper management. We need to distance ourselves from the reputation of having a timber production bias. We need a balanced multiple use approach.

(3) Good impact and loss information. Impact assessments should be carefully designed, and results of those impact studies should be accepted and even welcomed in the scientific literature as meaningful work. We have to have damage documentation if we want to convince people to change the way that they manage forests.

(4) Accurate and generally-usable models for the major forest insects and diseases. We are all aware of the power associated with models, and we are equally aware of the easy acceptance of figures produced by models that we as scientists have little faith in. Let us have a commitment to model systems that incorporate the very best knowledge we currently have AND the best that we can gain in the future.

(5) Procedures for doing economic analyses of pest management activities. I'm not particularly fond of economics myself, but I'm afraid that we do need dollar figures to compare treatment alternatives for insects and diseases. We also need ways to evaluate non-commodity resources, and we need to give them their true weights.

(6) Extensive insect and disease research that fosters understanding of ecological relationships useful for managers. I would place emphasis on elucidating site and environmental factors that favor survival, buildup, and spread of forest pests but there are lots of other worthy research areas. Currently, forest insect and disease research is not receiving anything like the emphasis that it deserves.

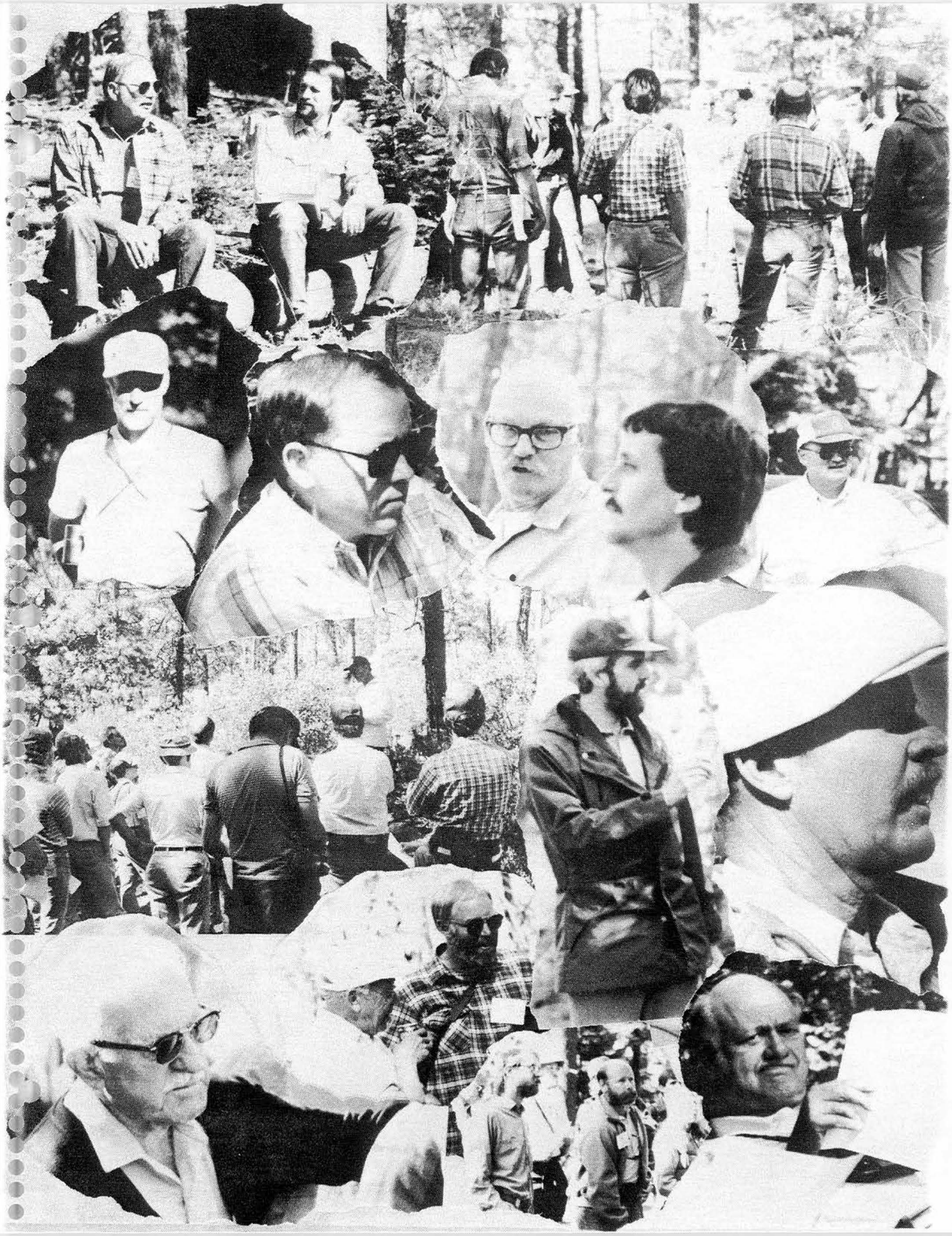
(7) Better record keeping capability. We need something that will allow managers to keep track of insect and disease treatments through entire rotations. If we continually lose sight of what was done just a few years ago pest management prescriptions will never be completed.

Well that's my list. Most of us in this room are actively involved in pursuing one or more of these objectives. It can be frustrating. Progress seems rather slow at times but we need to persevere. There is room in the study of natural resource management for optimists only.

I've spoken longer than I intended to. As one of Fields' students, perhaps I earned the right. Once again I welcome you to to Central Oregon and to the joint meeting of the Western International Forest Disease Work

Conference and the Western Forest Insect Work Conference. A high pressure system is promising us views of the Cascades, the field trips planned for the week include excellent examples of forest insect and diseases challenging the resource manager, the various panels, workshops, and papers are bound to be very interesting and the facilities offered here at the Inn of the Seventh Mountain should provide us with an excellent atmosphere for discussion. Enjoy the meeting!

D. J. Goheen



KEYNOTE PANEL: UNEVEN-AGED SILVICULTURE FOR INTERIOR FORESTS: THE CHALLENGE TO PEST MANAGEMENT.

Moderator: Everett Hansen

Participants: Tim Lillebo, Richard Everett, Don Wood, Wyman Schmidt.

A Vision of East-side Forestry

Tim Lillebo
Oregon Natural Resources Council

So called "pests" have a function in the natural ecosystem, and managers should try to understand these roles. Interfering with natural processes is a risky business; it may be appropriate for managers to "nudge" the system in a desired direction, but pushing too hard may have unexpected, and undesirable results. The ONRC emphasizes the equality of all forest resources, not just timber. Active forest management including timber harvest, is definitely part of the ONRC scenario for east-side forests, but with an emphasis on uneven-aged management, with longer rotations and larger target diameters. The goal is an aesthetically pleasing forest with a constant forest cover and respecting all resources. While most eastside forest should be managed for timber as well as other values, some sensitive areas need special restrictions. These include representative wilderness areas (managed with fire); winter range, visual zones, recreation areas, riparian zones, and old growth zones with connecting corridors.

Ambiguity in the Ecology of Uneven-aged Management

Richard L. Everett and Terry Lillybridge
Pacific Northwest Forest & Range Experiment Station
Wenatchee, WA

Any prediction of the long term ecological response by east-side forest to uneven-aged management is speculative in nature. Multiple stand entry and the maintenance of prolonged unnatural successional conditions under uneven-aged management are estimated to significantly alter current forest systems. Both even and uneven-aged management have the potential to simplify forest systems at the stand and landscape level as could be expected from applying relatively simple silvicultural prescriptions to complex forest systems. Inappropriate application of uneven-aged management may remove the natural patchiness of the forest landscape, simplify future seres, and/or reduce nutrient inputs required to maintain site quality. Conversely, uneven-aged managed forests may be unique in their ability to perpetuate healthy forest systems well beyond the age of the standing tree crop.

A silviculturist's view of uneven-aged management

Donald C. Wood
Forest Silviculturist
Ochoco National Forest
Prineville, OR
(503) 447-6247

Uneven-aged management is planned on about twenty-five percent of the National Forest lands east of the Cascades in Washington and Oregon. This is a significant increase over the past ten years. Most of this change has come as a result of the forest planning process. Uneven-aged management was selected to meet a variety of management objectives that include timber and non-timber goals. Meeting these objectives will require the best efforts of all of the forestry related professions. Uneven-aged stands is a broad description that can include a wide variety of conditions. Some critical items in uneven-aged management are the removal of trees, individually or in groups, at a regular interval to achieve or maintain a balance among diameter classes needed for sustained yield. To prescribe for uneven-aged management we need some terminology different from even-aged management. Terms commonly used are: target tree size, stand structure, stocking by size class, species, and size of groups. Recommendations were made for pest management personnel to deal with land mangers.

UNEVEN-AGED MANAGEMENT FOR INTERIOR FORESTS: PROBLEMS AND PROMISES

Wyman C. Schmidt, Project Leader
Subalpine Silviculture
Intermountain Research Station, USFS
Bozeman, Montana

The first half of this century was largely dominated by partial cutting practices that occasionally resembled good uneven-aged management but in most cases was logger's choice. These partial cuttings, coupled with intensive fire control practices, accelerated succession and gradually converted forests, from seral species such as ponderosa pine and western larch, to the more shade tolerant interior Douglas-fir and the true firs.

By mid-century managers saw what was happening and began to emphasize even-aged management to provide conditions more suitable for establishing young, even-aged stands of mostly seral species. Stands that resulted from these silvicultural practices were far less susceptible to insect and disease problems. Clearcutting was the most commonly used silvicultural system. Although suitable biologically for the regeneration process, clearcutting did not win any popularity contest with the public because of how it looked. The Eighties have seen increasing public resistance to clearcutting and we must examine

other systems. The crystal ball is not entirely clear but with proper use of uneven-aged management we can likely expect:

The Good:
- Better acceptance by the public
- Improved habitat for some wildlife
- Little effect on water yield and sediment
- More acceptable aesthetically
- Continuous green cover

The Bad:
- Decided shift toward shade tolerant species
- Increase in pest problems
- Increase in tree injury
- Decreased timber yields
- Frequent entries needed
- More intense road activities
- Harvesting difficulties

If the management decision is to use some form of partial cutting to meet resource objectives the three most likely options and some of their characteristics are:

Single-tree Selection (Uneven-aged)
- Reserve stands need to be carried at low densities to maintain vigor and permit establishment of seral species
- Will permit some degree of species diversity if not too dense
- Only option on some harsh sites

Group Selection (Uneven-aged)
- Gives both seral and climax species an opportunity to establish
- Gives lots of edge effect for wildlife
- Can remove clusters of pest susceptible trees

Shelterwood (Even-aged)
- A system used far too little
- Can maintain green cover
- Can establish even-aged stands that appear uneven-aged
- Compatible with silvics of both seral and climax species

The choice of silvicultural systems to meet special management objectives will not always reduce pest problems. Pests should always be considered in making silvicultural decisions because they often dictate the success or failure of the system.

WORKSHOP: INTERACTIONS BETWEEN BARK BEETLES AND ROOT DISEASES
Moderators: Don Owen, Jill Wilson
Participants: More than 25

Discussion focused around six presentations given by Leon LaMadeleine, Don Goheen, C.J. Demars, Stefan Zeglen, Dick Schmitz, and Bov Eav. Leon described the results of the recent W110 meeting in Bend. There was discussion after about the history and role of the W110 project.

Don Goheen discussed pests of true fir on Oregon's eastside. Long-term observations revealed that 80% of trees infested by Scolytus ventralis also had root disease. Annosus, Armillaria, and laminated root diseases were the most common. During the past two years, which have been drier than normal, a lower percentage of beetle infested trees have had disease. Don speculated that trees without obvious root disease symptoms may still be infected. Drought stress may be masking the presence of root disease by predisposing lightly infected trees to beetle attack.

C.J. Demars presented some of George Ferrell's work on Hylastes macer, a vector of black stain root disease. Pit fall traps placed in ponderosa pine stands and baited with 2% alpha-pinene and ethanol caught the highest numbers of beetles in mid-June or earlier. Uncut stands had lower beetle populations than cut stands. These results indicate that the timing of thinning and harvesting activities may influence disease initiation in stands.

Stefan described his work in Utah on levels of Armillaria root disease (ARD) occurring on lodgepole pine. ARD colonized 4-52 percent of the examined root length of individual trees; however, none exhibited typical external symptoms. Lodgepole may exhibit external symptoms only at very advanced stages of disease development. Mountain pine beetle (MPB) at endemic levels may utilize these stressed trees. Stands with sufficiently high disease levels may serve foci for development of epidemics of MPB.

Dick discussed his work with endemic populations of MPB. MPB often attacks trees infected by stem and root disease, and other scolytids. The long term effect of the diseases is to reduce phloem thickness and MPB brood survival. Other scolytids are better adapted for survival in thin phloem and restrict the length of bole available to MPB. When the effect of these pathogens on growth is recent and phloem thickness is maintained, MPB survival increases.

Bov described how bark beetles are treated in the Western root disease model. Effects of bark beetles on tree mortality in stands infected with either ARD or Phellinus may be simulated. In the model these agents interact with the root disease process by influencing inoculum levels and potential disease spread. Three types of beetle-stand interactions are simulated.

WORKSHOP: ROLES OF INSECTS AND PATHOGENS IN LONG-TERM SITE PRODUCTIVITY
Co-moderators: Keith Reynolds and Tim Schowalter
Participants: about 30, including Rene Alfaro, Hal Burdsall, Bob Edmonds, Everett Hansen, Paul Hennon, and Torgy Torgerson

Reynolds and Schowalter welcomed participants. Introductory remarks included discussion by Reynolds of the new PNW program on long-term site productivity (LTSP), and presentation, by Schowalter, of the hypothesis that activities of organisms traditionally viewed as pests in forest communities may sometimes be beneficial to LTSP through their effects on nutrient cycling and vegetation diversity.

With respect to the role of insect pests, Schowalter reviewed data from Boyd Wickman indicating that compensatory tree growth over 10-20 yr was sufficient to offset short-term growth reduction following defoliation. Alfaro presented more recent data showing that compensatory growth increased with increasing level of defoliation, whereas non-defoliated trees showed no change in growth increment. In studies with controlled defoliation, Schowalter found that a maximum of 20 % defoliation resulted in doubling water and litter inputs to the forest floor under study trees. Furthermore, nitrogen, potassium, and calcium inputs were increased 20-25 % following defoliation.

Concerning the roles of forest pathogens, Reynolds and Burdsall suggested that decay fungi, considered destructive in old-growth stands, may be beneficial as recyclers in young-growth stands. Hennon mentioned Bormann's work in SE Alaska on the role of tree windthrow in soil mixing and its role in maintaining site productivity. Hennon and Hansen indicated that butt rot fungi may actually interfere with this process by causing stem breakage that would preclude windthrow. It was also emphasized by Hansen that there are progressive degenerative effects of at least certain root diseases on stand productivity, but Torgerson and Burdsall suggested that, even in such cases, LTSP (more broadly defined than stand productivity) may be enhanced through the creation of greater structural diversity. Torgerson's work suggests that structural diversity helps maintain parasites and predators of insects in sufficient numbers to regulate defoliator populations at low, non-damaging levels for long periods between outbreaks.

The focal point for much of the discussion was how insects and pathogens influence nutrient cycling. It was clear from this discussion that it would be useful to distinguish between stand and site productivity. It was generally concluded that too little is known about "pest" effects in forest ecosystems to discard the possiblity of useful roles. Clearly, more research is needed in this area by both pathologists and entomologists, since current pest management practices will influence LTSP.

WORKSHOP: NURSERY/SEEDLING PEST MANAGEMENT
Moderators: Diane Hildebrand and Gwen Shrimpton
Participants: 21

Bob James: Western white pine and Engelmann spruce exhibit scattered mortality due to Basamid fumes in low drainage areas. The response occurs over night and illustrates high genetic variability in the seedlings. Western larch exhibits a gradation in height--stunting due to Pythium near the risers where the soil is not fumigated. Art McCain suggested injecting Metham Sodium (Vapam) into the irrigation system from first drop to the last to assure the best coverage to a predetermined depth. Vapam produces methyl isothiocyanate, the same active ingredient of Basamid.

Storage mold was caused by an unidentified fungus which grew at 2 deg. F, and apparently came from soil on the foliage. The fungus spread rapidly and destroyed mostly needles; the buds were still healthy but entire boxes of seedlings were culled. The infected boxes may not have cooled down right away on a busy lifting day with the cooler too full and fluctuating temperatures. British Columbia (BC) sprays Captan and Benlate on seedlings before lifting, and keeps the foliage wet. McCain suggested using chlorothalonil along with wetting foliage. These treatments are more hazardous for workers to handle.

Cleaning containers is a continual problem because seedling roots grow into the styrofoam walls, and even Ray Leach cells do not come clean. Bob James has isolated Fusarium, Pythium, Cylindrocarpon, and Phoma. In BC, 15% sodium meta-bisulfite was effective but far too toxic to workers (even 2-5% caused coughing up blood). Jack Sutherland used sugar in warm water to force fungal resting structures and then hot water, hydrogen peroxide and sodium meta-bisulfite all seemed to work experimentally. Bob James uses new containers for susceptible species and older ones for more resistant species.

Will Littke reported more Trichothecium rot in seed orchard seed during late stratification and after sowing. Methyl bromide with 33% chloropicrin is 100% effective while 22% chloropicrin is 60% effective. Lygus bugs attack buds, affecting root growth potential. Lygus bugs come in from agricultural crops in 3 main pulses as monitored by flight traps. It's best to spray at the times of influx in the early morning while the bugs are still sluggish, because by afternoon they fly away and dive for cover.

Phil Hamm reports that Oregon State University is working on biological control of Fusarium diseases, cover crops to reduce pathogen levels, how long Ridomil remains effective in plant tissues, and the nursery pests book. Tentative indications are that beans and sudan grass increase pathogen levels while crucifers, grass, bare fallow, and composted sawdust reduce levels of Fusarium and Pythium.

Sally Campbell reported for Tom Landis that the Agric. Handbk on Forest Nursery Pests and the Container Manual, vol. 5 on Nursery Pests and Mycorrhizae, will both be printed in Fall 1989. The Washington Office (USDA For. Serv.) is encouraging chemical companies to re-register our minor use chemicals, and there is no danger of losing methyl bromide/chloropicrin

Jack Stein reported that the balsam twig aphid on white fire in Placerville caused $250,000 in damage including lost site preparation in 1987. The flocculent waxy aphid kills buds and invades buds all season in white fir in California. A lot of seedlings with infested and dead buds are not being culled. Christmas tree growers use chemical control.

Roger Sandquist reported curled needles with some lesions due to unknown causes at Bend Nursery. Littke thought Lygus bugs affected the buds the previous season

Jack Sutherland and Gwen Shrimpton reported balsam wooly aphid as a potential problem based on artifical inoculations. Trisetacus, the pine needle mite, caused scattered chlorosis, needle stunting and twisting. Keithia foliar blight of cedar was found in containers first in 1988. They are modifying seedling density. Lygus bug causes more damage on container lodgepole pine in British Columbia, and more on bare-root Douglas-fir in the Pacific Northwest.

WORKSHOP: ASSESSING PEST IMPACTS ON NON-TIMBER RESOURCES
Moderators: F.A. Baker and A. Lynch
Participants: C. Shaw, F. Hawksworth, F. Baker, T. Daniel, B. Orland

Terry Shaw (RMFES) reported efforts to manage dwarf mistletoe infested ponderosa pine stands in the Valle Vidal, a high quality elk habitat in New Mexico. He discussed the need for wildlife managers to better define their habitat needs in terms forest managers can deal with, eg. expressing hiding cover needs in terms of stems or basal area per acre. Pest managers must also improve their ability to project future stand condition under management and do nothing alternatives.

Frank Hawksworth (RMFES) summarized a study of dwarf mistletoe effects on stand structure in the Pike National Forest. Preliminary results suggest that more birds, porcupines, deer and elk use stands with greater dwarf mistletoe ratings. He also reported on a recently recognized adaptation for survival by dwarf mistletoe -- spotted owls often use dwarf mistletoe brooms for nesting sites.

Fred Baker (Utah State Univ.) discussed a study of the impact of limb rust on visual quality in southern Utah ponderosa pine stands. Viewers reacted negatively to increasing incidence and severity of limbrust, but this perception could be altered by discussing the value of dead trees for wildlife.

Terry Daniel (Univ. of Arizona) mentioned studies of the effect of Pandora moth defoliation on the quality of camping experience in terms of willingness to pay. He pointed out one difficulty in such research in forest recreation is "who is the client -- who are we managing for?" To some publics, the cure may be worse than the pest.

Terry and Brian Orland (Univ. of Illinois), in a cooperative study with RMFES, are exploring how WSBW defoliation and mortality affect scenic values. They demonstrated a computer graphics simulation of WSBW effects. Such simulations provide the advantage of varying only the factor in question -- WSBW defoliation and tree killing. Recent computer developments have facilitated great improvements in image quality, permitting construction of very realistic images.

Brian Orland is also involved in assessing visual effects of vegetation management options associated with management of Eucalyptus stands in Australia.

The future holds models that will map stands and various future levels of pest attack, eg. defoliation. We may also be able to draw the scenes with pest impact. We must work to improve methods for quantifying pest incidence and severity.

Approximately 25 people attended the session.

WORKSHOP: TECHNIQUES FOR MEASURING IMPORTANT HOST CHARACTERISTICS RELEVANT TO PESTS: TREE VIGOR AND NUTRIENT STATUS

Moderator: Michael R. Wagner

Participants: G. Byford, J. Entry, C. Parks, M. Fenn, J. Wernz, B. Moltzan, T. Gray, P. Wargo, B. Thoeny, K. Zogas, D. Lyon, C. Sanders, R. Eiber, F. Hastings, A. Mackenzie, E. Nebeker, J. Schwandt, K. Lister, D. Grimble, W. Thies, J. Summers, J. Hoffman, J. Pronos, D. Schultz, S. Talhouk, D. Herms, K. Clancy, T. Paine, H. Cameron

The workshop was organized in the WFIWC "tradition" of no formal presentation. A significant part of the workshop was spent having participants introduce themselves and indicate their interests in the general topic. It was quickly evident that many of the participants were interested in the various techniques to measure tree vigor. One of the objectives of the workshop was to get individuals with experience using various vigor assessment methods in contact with individuals who wished to know more about the various methods. Most of the workshop was then spent discussing the various approaches to measuring stress.

The group identified and systematically considered the major vigor estimation methods. The following methods were discussed: xylem water potential, resin system characteristics (total flow, rate, viscosity, rate of crystallization), starch and sugar accumulation, secondary metabolites, stomatal resistance, cambial electrical resistance (shigometer), reflectance, relative H_2O content, and ultra sound.

An important issue came up in discussion regarding how stress should be measured. The group identified the need to consider what a particular stress measurement is assessing relative to what is important to the herbivore. It is clear how a measurement of, say, resin flow would relate to bark beetle susceptibility, but not nearly as clear how rate of growth would relate to bark beetle susceptibility. Researchers were encouraged to attempt to make a mechanistic link between their stress measurement and what is relevant to the herbivore.

The appropriateness of using a single stress assessment method across a variety of plants and insect herbivores was discussed. It was pointed out by several workers that xylem water potential, which is a widely used method of assessing water stress, did not appear to be an appropriate method for birch. Differential watering changed several plant traits in birch that affected herbivores, but which could not be detected by xylem water potential. It seems important to recognize that plants have various adaptive strategies for dealing with water stress and the selection of stress assessment methods should consider these characteristics.

Finally, the group agreed that more discussion was warranted on this general topic with perhaps a greater focus on "hands-on" demonstrations of stress assessment. A lot of work needs to be done before a "best" method of measuring stress can be recommended.

WORKSHOP: Silvicultural Strategies for Pest Complexes
CO-MODERATORS: Borys Tkacz and Dayle Bennett
PARTICIPANTS: 50 Attendees

Borys Tkacz introduced the workshop theme, "Silvicultural Strategies for Pest Complexes," and noted that the objective of the workshop was to present and discuss a variety of new, as well as proven, silvicultural strategies being studied and implemented on both individual pests and pest complexes. Following Borys' introduction, several people made presentations on a variety of silvicultural strategies.

Ken Gibson presented information on the incorporation of pest management considerations into the silvicultural process in the Northern Region. This process usually involves a combination of techniques including, insect and disease management workshops, service trips, and reviews of silvicultural prescriptions by pest management specialists. Ken reported that these techniques have established a good rapport with district and forest silviculturists, and have led to successful incorporation of pest management strategies in the silvicultural process.

Catherine Stewart presented results of a study she has done which illustrated some adverse effects of underburning on Douglas-fir seed trees. Such underburning on certain Douglas-fir sites apparently aggravated the incidence of Armillaria root disease and Douglas-fir beetle, resulting in 40 percent mortality of the seed trees. This work has resulted in recommendations against underburning on these sites.

Clint Carlson led an interesting discussion on the potential consequences of unevenaged management in regards to forest pests. He pointed out that while evenaged silvicultural systems are very effective in reducing long-term risk to western spruce budworm, dwarf mistletoes, and probably Armillaria root disease, unevenaged management will generally increase and perpetuate the risk of these pests. He went on to say that an exception might be made on dry Douglas-fir habitat types where risk to the aforementioned pests might be minimized if ponderosa pine is featured and maintained in an unevenaged distribution by frequent entries for harvesting and cleaning. On these sites, encroaching Douglas-fir could be held back by utilizing light intensity ground fires every five years or so.

Dick Mason and Greg Filip presented an array of interesting information on studies they are conducting to determine the effects of fertilization and/or thinning on western spruce budworm, Armillaria and annosus root diseases, and a variety of dwarf mistletoes. Some of these strategies appear to increase host tolerance and/or offset adverse impacts of the pests.

Bernie Raimo presented a guide he has devised for use in determining appropriate silvicultural prescriptions to manage pests in ponderosa pine on the Uncompahgre Plateau. This guide is essentially a dichotomous key that is based on a risk rating system for mountain pine beetle, dwarf mistletoe ratings, and Gingrich stocking guides for southwestern ponderosa pine.

WORKSHOP: TREE PATHOGEN/DEFOLIATOR INTERACTIONS
Moderators: Judy Pasek and Catherine Parks
Participants: Phil Wargo, Greg Filip, Ladd Livingston, Judy Pasek, and 18 attendees

Phil Wargo presented evidence that the root pathogen, Armillaria gallica, attacks and kills oaks following defoliation by gypsy moth (Lymantria dispar). Defoliation alone did not kill trees but altered the root chemistry, causing an increase in glucose and fructose and amino-nitrogen which favors the growth of Armillaria. Defoliation could also predispose surviving trees to subsequent defoliations by inducing non-fatal infections on portions of the root that could become fatal during the next defoliation. Early mortality in stands defoliated by the gypsy moth was related to Armillaria attack but later mortality was due to both Armillaria and Agrilus bilinneatus, the two-lined chestnut borer. The density of rhizomorphs of A. gallica increased in the soil within five years after defoliation especially near the dead trees but also in the general area. This increase in inoculum may increase the potential for Armillaria root disease in the forests.

Greg Filip described the effects of Douglas-fir dwarf mistletoe (Arceuthobium douglassii) and western spruce budworm (Choristoneura occidentalis) on growth of Douglas-fir. The budworm completely defoliated new shoots and buds of all branches sampled including those infected by dwarf mistletoe. Decreases in radial growth were associated primarily with increases in dwarf mistletoe severity. Radial growth loss of host trees was greatest when simultaneous infestation of the pests occurred.

Ladd Livingston presented observations on interactions between incidence of larch casebearer (Coleophora laricella), larch sawfly (Pristiphora erichsonii), larch needle blight (Hypodermella laricis), and larch needle cast (Meria laricis) in Idaho. In the late 1950's to early 1970's, needle diseases were absent and larch casebearer populations were high. Larch sawfly populations were low because earlier feeding by the larch casebearer depleted the food source. Now, needle diseases are present and larch casebearer populations are low. It was suggested that the diseases may be outcompeting the larch casebearer for nutrients. Sawfly populations have increased apparently because of less competition with the larch casebearer.

Judy Pasek reported that the incidence of pine needle sheathminer, Zelleria haimbachi, is greater on geographic sources of ponderosa pine that are resistant to Dothistroma pini needle blight than on highly susceptible tree sources in southeastern Nebraska. Defoliation is less in lower crowns where needle blight infection predominates. Resistant sources averaged higher numbers of total needles per shoot and undefoliated needles per shoot than susceptible sources. Dothistroma needle blight appears to have a greater impact on ponderosa pines than does the pine needle sheathminer; therefore, control of the needle blight should be emphasized.

WESTERN INTERNATIONAL FOREST DISEASE WORK CONFERENCE (WIFDWC)
WESTERN FOREST INSECT WORK CONFERENCE (WFIWC)

Joint Meeting - 1989 - Bend, Oregon

Workshop: Pests of Young Stands (10-60 years)
Moderators: Will Litke
Lorraine Maclauchlan

Participants: Roger Sandquist, USDA Forest Pest Management, Portland, Oregon
Thomas Maher, TFM Forestry Ltd., Kamloops, B. C.

Tom Maher -

In British Columbia, the black army cutworm, Actebia fennica, causes major defoliation on year old burnt sites which have been planted with conifers due to a lack of their normal herbaceous forage. Adults seek out newly burnt areas to lay their eggs. Normally larvae begin feeding on herbaceous plants as soon as the snow melts in the spring, but in the absence of herbaceous cover they will feed on newly planted conifer seedlings. This at first appeared to be catastrophic to new plantations, but upon investigation it seems seedlings of all species appear quite resilient to the effects of BAC defoliation, even when terminal bud and bark feeding damage has occurred. The majority of BAC-relatedd mortality occurs within the first season, and mortality losses due to poor planting are usually greater than the losses due to BAC. Pheromone trapping of adult BAC moths pinpoint the areas which have the potential for BAC infestations.

The complex system of BAC defoliation and seedling damage is an interaction of a multitude of factors including the quantity and quality of herbaceous vegetation, timing of planting and species of seedling involved. A management system is being developed for use at the field level, so that potential problem sites can be identified in advance of an infestation.

Roger Sandquist-

Due to drought in the Region, insects not usually encountered are causing problems. One insect that was anticipated to occur was grasshoppers, so it was suggested to introduce Noseina lacustrae into the environment. However, this was not done. Therefore an infestation occurred in a seed orchard. Now N. locustrae is being put on the orchard (microsporidia on bran and broadcast sprayed on orchard). In this way it lives in the environment and is transferred generation to generation in eggs.

Lorraine Maclauchlan-

WHO is the real advisory? Insects or diseases . . . or the Forest Manager? As pest managers, our goal should be for "Forest Health" to DRIVE "forest management". However, plantations/regen. as we are seeing them now are NOT examples of ideal forest management because pest management is being called to the rescue as a BAND-AID for poor forest management practices.

As an example, silviculturalists dictate thinning in Pl at age 10-12 years. Then 2 years after stand entry there is great concern over 12% of their crop trees expiring and at increasing rates. This is why we must sell pest management to forest managers so they can hazard rate stands at the pre-harvest silviculture prescription stage.

Pissodes schwartzii / Cronartium commandrae complex: -

A 12 year old stand was spaced to 1200 stems/ha in 1984. By 1986, 10% of the leave ~~trees were~~ killed by Commandra rust. The same survey was done in 1989 and an additional 10% of the crop trees had died since 1986 from Commandra infection and there is an alarming number of new infections in both the remaining crop trees and ingrowth. In addition to this, a root weevil, Pissodes schwartzii, is hastening mortality of these infected trees with over 40% of Commandra infected trees colonized by P. schwartzii. These weevils also colonize the fresh stumps of the spaced trees thus building the population to very high levels. If there were no stressed trees available would these weevils colonize healthy trees?
There could be a potential for mass trapping P. schwartzii because of the habits and setting of the insect. In a pitfall trapping experiment done in 1989, there was strong evidence of a male produced pheromone.
Also present in this stand was western gall rust and Pissodes terminalis so that the prognosis for this stand is that it may become NSR.
A hazard rating system of young pine stands is being developed for Pissodes terminalis incorporating biogeoclimatic zone, age, incidence, elevation, life history and silvicultural treatment.

WORKSHOP: ADVANCES IN BIOLOGICAL CONTROL OF FOREST PESTS
Moderator: John W. E. Harris
Participants: Charles Dorworth (recorder), Gene Amman, Bob Celaya, Mary Lou Fairweather, Jerome Girard, David Grimble, Dennis Hamel, Philip Hamm, Kevin Hosman, Daniel Jennings, Herb Kulman, George Markin, Dick Mason, John Moser, Steve Munson, David Neff, Bran Onken, Bernie Raimo, Alice Ratcliff, Gwen Shrimpton, Paula Spaine, Torgny Unestam.

John Harris described enhanced clipping of spruce terminals attacked by Pissodes strobi in British Columbia. Infested leaders were placed in screened containers from which only the parasites and predators could escape back into the plantations. Careful, thorough clipping was important. Laboratory rearing of one predaceous fly, Lonchaea corticis, was attempted without success to date. Suggestions were solicited.

C. Dorworth then reviewed mycoherbicide research at the Pacific Forestry Centre, begun in 1986; it currently includes seven scientists. Principal plants dealt with were Acer, Alnus, Calamagrostis, Epilobium, Gaultheria, Populus and Rubus. Fungi being tested now were listed and methods described. The objective was to constrain the weeds until the trees were able to emerge above them.

George Markin then noted that forest weed biocontrol had been long established in Hawaii, where there are three pathologists at work. Hawaiian pathologists are attempting to control the incursion of imported weeds which threaten to overwhelm native flora and some successes have been achieved. Both fungi and insects have been imported from the native areas of these exotic species. This is the oldest biocontrol operation in the U.S.A. Hawaiian registration procedures are unique within the nation.

Philip Hamm then indicated that he and Everett Hansen were working on biocontrol of damping off and hypocotyl rot of conifer seedlings caused by Fusarium oxysporum. These two problems may get worse, particularly if the use of fumigants in the future are curtailed. Two general methods are being investigated: (1) attempting to lower propagule numbers in the soil through cover cropping and (2) seed treatment using fungi and/or bacteria antagonistic to Fusarium. Generally after the seedling crop is lifted, a cover crop is grown and is then followed by soil fumigation. Recent work has concluded that cover crops contribute to the build up of soil propagules whereas not growing a cover crop does not. Current work

is focusing on cover crops (such as mustard sp.) which actually may decrease propagule numbers. Mustard synthesizes glucosinolates which degrade to yield fungitoxic by products, i.e. a natural fumigant. The use of cover crops plus soil solarization hopefully will lower propagule numbers.

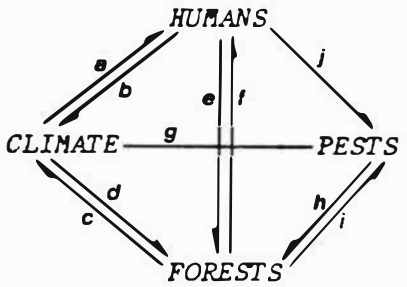
The new effort in Hamm's lab will involve isolation, cultivation and re-inoculation of antagonistic or non-pathogenic microorganisms from the soil and attempts to use them as a seed treatment to discourage or kill Fusarium oxysporum.

Finally, much time was spent discussing the concept of and the public's perception of environmentally safe work. There was recognition of the need to do environmentally safe work i.e. not introducing species which might adversely affect the existing balance of species, and the requirement to have the work perceived as environmentally safe by the public. Otherwise we could lose this method of controlling pests, as we are now losing the use of conventional chemicals.

WORKSHOP: CLIMATE CHANGE, POLLUTION, FOREST, AND PEST INTERACTIONS

Moderator: Paul Hennon
Participants: George King, Phil Wargo, Tim Showalter, Skeeter Werner

Interest among the public, media, politicians, and scientific community on the effect of pollution and climate change on forest ecosystems is developing rapidly. Viewed ecologically, the interaction of forests, climate, pests, and human activities (such as pollution and forest harvesting) is a complicated web, each factor having some influence on most other factors. Below is a model that attempts to simplify the possible interactions. Complex loops involving most factors probably more accurately represent how these factors interrelate in nature.



Examples of possible simple interactions are:

a) Warming raises oceans, flood cities
b) CO_2, methane, etc. cause warming
c) Deforestation causes global warming
d) Freezing, drought damage forests
e) Pollutants (ozone) damage forests
f) Forests provide timber, recreation
g) Climate change alters pest ranges
h) Pests affect forest productivity
i) Tree vigor affects pest populations
j) Direct control of pest populations

Current attempts to model the possible effects of greenhouse gases (e.g., CO_2, methane) on climate were discussed by George King. Models suggest increased average temperatures of several degrees C due to a doubling of concentration of greenhouse gases, but predicted differences occur regionally. Precipitation would be altered in most regions. Climatologists are faced with difficulty in distinguishing the effects of atmospheric pollutants from natural variation in climatic patterns.

As all biological processes are modified by temperature, all forests, including their insects, tree pathogens, and trees, will be affected to some degree by an altered climate. Climate change and air pollution can influence forest pests directly, through day degree accumulation and developmental rate, and indirectly, through changes in host susceptibility and entomopathogen virulence. Range expansion or constriction of pest or tree species would probably occur.

Climate change and pollution have been suggested as possible causal factors in some of the numerous forest declines with unsolved etiologies. Several forest declines are apparently independent of humans (pollution) and may have been triggered by climate change.

Skeeter Werner discussed the USDA Forest Service's plans to develop the Forest/Atmosphere Interactions Priority Research Program (F/AI PRP) under the broad national concept of Forest Productivity and Health in a Changing Atmospheric Environment.

Discussion of these topics, even in an integrated nature, is not new; they were treated by G. Hepting in 1963 (Ann. Rev. Phytopath. 1:31-50). The future offers opportunities of funding and challenging research to unravel the effects of these interrelated factors on forest ecosystems.

Workshop: International Concerns with Forest Pest Management
Moderators: Charles G. Shaw III and William M. Ciesla
Participants: Ron Billings, Jose Cibrian, Ignacio Carbajal, and Jorge Macias.

About 25 people attended this session. The moderators introduced the topic with comments on the need for more international cooperation and understanding of mutual pest problems, concerns with atmospheric deposition, and global climate change. Three presentations followed; these are summarized below.

Ron Billings described a recently implemented program for suppression of southern pine beetle infestations in Honduras. Using guidelines developed by the Texas Forest Service, the Honduran Forestry Development Corporation has achieved excellent results since 1984 with prompt detection and application of "cut-and-leave" operations to halt expanding infestations. The average size of treated infestations was reduced from 35 acres to less than one acre per spot. In addition, total timber losses were reduced by 93% in the Yoro District in comparison to previous years without control or other forest districts where little or no control was applied. Valuable seasonal data also have been collected since 1984 on monthly patterns of detection for new spots of southern pine beetle attack in Honduras, and how these patterns are influenced by the occurrence and timing of wet and dry seasons.

Bill Ciesla described bark beetle activity in Chile where three species, Hylastes ater, Hylurgus ligniperda, and Orthomicus erosus, have been recently introduced and are attacking radiata pine (Pinus radiata) in plantations throughout south central Chile. All three species are native to Europe and have been introduced into other regions of the world where pines are now grown, including Australia, New Zealand, Japan, South Africa, and Sri Lanka. All breed in slash, freshly cut stumps, and decked logs and all carry blue stain fungi that can cause degrade when introduced into decked logs. Hylastes ater and Hylurgus ligniperda damage young seedlings by invading their root collars and feeding downward into the roots. In addition, H. ligniperda has been found in dead trees attacked by a black staining fungus in the genus Ceratocystis (Verticicladiella). Presumably all three species of bark beetles entered the country on pine crating containing strips of bark.

Jose Cibrian and Ignacio Carbajal, with translation assistance from Jorge Macias, described some forest pest concerns in Mexico. Work on the looper, Evita hyalinaria hyalinaria, a defoliator of sacred fir (Abies religiosa) was reviewed by Ignacio Carbajal. An outbreak of this insect began in 1985 in fir forests near San Felipe del Progresso in the state of Mexico. Trees were severely defoliated with the most intense defoliation occurring in the lower crown. Infested areas were treated with an aerial application of Bacillus thuringiensis. One of the major concerns was the potential impact of Bt sprays on the migratory monarch butterfly which over winters in stands within several kilometers of the outbreak area. Monitoring of spray effects is in progress.

The status of decline and mortality of sacred fir in the Desierto de los Leones National Park, southwest of Mexico City was described by Jose Cibrian. High levels of ozone in the heavily populated Mexico City basin are believed to be the primary cause of decline. Salvage operations, reforestation with conifers less susceptible to ozone, and monitoring of the remaining stands of sacred fir with color IR aerial photography and ground surveys is continuing.

In response to a question, the Mexicans commented on the status of pitch canker in Mexico--a disease which has been reported from 8 states in central and northern Mexico. At least 6 species of pines are affected. The disease has been known in Mexico since 1985, but it may have been present earlier. It is unknown whether the disease is native or introduced to Mexico.

POSTER ABSTRACTS

CLIMATE CHANGE AND INSECTS
Tim Schowalter

Climate change and air pollution can influence forest insects directly, such as through day-degree accumulation and development rate, and indirectly, such as through changes in host susceptibility and entomopathogen virulence. Complex forests can ameliorate environmental conditions and may be less sensitive to changes than are the widespread young stands exposed to extreme fluctuations of temperature, moisture and atmospheric chemicals.

Poster Title: HOST PLANTS ALTER INSECTICIDE SUSCEPTIBILITY IN GYPSY MOTH

Authors: James Wernz, Alison Moldenke, Ralph Berry, Jeffrey Miller, and Gladwin Joseph

Abstract:

Third instar Gypsy Moth larvae fed Douglas-fir were more tolerant of topically applied Dimilin and Carbaryl than larvae fed white alder. Third instar larvae reared on white alder were more tolerant of ingested Orthene and Dimilin than larvae fed Douglas-fir. Neither host plant provided a significant difference in tolerance to topically applied Orthene.

PITCH CANKER WOUND DRESSINGS

A. H. McCain, J. C. Correll, T. R. Gordon

Monterey pine (Pinus radiata) is extremely susceptible to pitch canker, caused by Fusarium subglutinans. The fungus is spread by insects, and can infect through wounds. Pruning branch infections may aid in control of the disease by removal of inoculum from the tree. Non-water carriers of the fungicides (1%) benomyl and thiabendazole were effective as wound treatments to prevent infection if applied prior to inoculation. One brand of paint (L & H Modern Lux Plastic Enamel) was superior to all other carriers including another brand of enamel paint. The superior performance of this paint is likely due to the solvents which allow some of the fungicide to dissolve and enter the pruned shoots via resin that rapidly exudes when the shoot is cut. The use of an effective wound dressing will allow sanitation pruning of pines to reduce inoculum originating from infected branches and solve the dilemma of providing another wound for entry of F. subglutinans.

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Poster: Integrating Plant Health and Pest Management for Arborists

Author: David G. Nielsen

Abstract: Traditional pest control activities in urban and community forests have included both general-purpose and targeted pesticide applications. Reduction of our pesticide aresenal, increasing concern about non-target impacts of pesticides, including ground water contamination, and general increase in environmental awareness and activism demand that tree care professionals use pesticides only when and where necessary. Plant health care and IPM tactics can be used in an orderly program to improve the vitality of trees and shurbs and reduce the need for regular pesticide applications. This approach may be mandated by State and Federal governments unless the industry assumes leadership in implementing this change.

POSTER: PESTS LINK SITE PRODUCTIVITY TO THE LANDSCAPE
Presenter: Tim Schowalter and Joe Means

Landscapes that are mosaics of host and non-host tree species or age classes limit the effect of potential pests by providing barriers to dispersal and habitat for predators. Landscapes managed for particular species or age classes promote pest epidemics that can threaten future forest productivity.

ABSTRACT

OZONE IN PUGET SOUND FORESTS. Robert L. Edmonds and Tony Basabe, College of Forest Resources, University of Washington, Seattle, WA 98195

Over the last couple of years ozone has been monitored at a number of forested sites in the Puget Sound area. The highest concentrations were recorded in the Cedar River Watershed, 55 km SE of Seattle. Maximum hourly concentrations increased from 1986 (122 ppb) to 1987 (138 ppb) and 1988 (196 ppb). Concentrations were much lower in 1989, a cooler year with lower radiation. We have identified two main ozone plumes (south and east of Seattle and north of Bellingham, from Vancouver, B.C.).

POSSIBLE INSECT VECTORS OF PINE PITCH CANKER DISEASE IN SANTA CRUZ COUNTY, CALIFORNIA.

Dr. Joseph W. Fox
Department of Entomology
University of California
Berkeley, California 94720

Pine pitch canker disease (caused by the pathogen, Fusarium subglutinans) appears to be a very recent introduction in California. The disease is found on pines along the central coast, particularly Monterey pine (Pinus radiata). Insects may be involved in the abundance and distribution of the disease by being carriers of propagules of the pathogen or by being wounding agents on trees. The pathogen has been recovered from several species of insects in Santa Cruz County, California. These insects have been captured in flight using pheromone traps or they have been recovered from traps placed on pitch canker infected tree branches or healthy tree branches which can be likely infection sites. Experimentally, we have demonstrated Ips species (I. paraconfusus and I. mexicanus) ability to transmit the disease to uninfected pines. Ips species exhibit a fidelity of association with the disease through all life history stage both experimentally and naturally. If Ips spreads the disease, these species may be important as secondary vectors of the disease. Other insects such as Pityophthorus, Conophthorus, and an anobiid, Ernobius punctulatus, may be more important as primary carriers of the disease.

Wood-Destroying Organisms Workshop, Bend Oregon, September 14, 1989

Theme of the meeting was to present State-of-the Art and future of WDO research.

Minutes of the Meeting

Future of Forest Projects Pathology - W. Wayne Wilcox

1. Education of the user (designers, builders, general public or building owners).

2. Nondestructive examination of decay in structures (also diagnosing active WDO insect infestations in structures).

3. New regimes for protecting wood from biodegradation in the absence of toxicants, i.e. biological control and modifications of wood chemistry.

4. Evaluation of 3rd generation wood preservatives, and their effects on nontarget organisms. There will be a variety of compounds or techniques used in specific applications. In the future it will be much more expensive to prevent wood decay.

5. Increase knowledge of wood-destroying fungi - biological, taxonomic, phylogenetic and specialization of fungi in different environments

Pathology Research at the Forest Products Laboratory, Madison, WI was discussed by Hal Burdsall.

o Institute for Microbial and Biochemical Technology (Kent Kirk). Investigations of biodeterioration or biodegradation as positive uses of wood-degrading organisms; lignin degradation, wood pulping, pretreatments to reduce the energy needed in pulping, fungi to break down toxic wastes, and fungi to clean up mill effluent.

o Biodeterioration of Wood (Terry Highley). Basic biochemical mechanisms of decay, serological examinations, and mechanisms by which enzymes are delivered by fungi taken to wood tissues containing lignin for wood decomposition.

o Center for Forest Mycology Research (Hal Burdsall). Taxonomy of fungi, Armillaria root rot, serological investigations of Phlebia for diagnosis of species, and other ways to distinguish species. They are developing a chicken egg technique as an immunological test for identification of species or strains. They inject fungal tissue into each breast and each leg of a chicken and repeat the process in 1 week. This results in an increase in diagnostic titer in the eggs after approx. 3-4 weeks.

o The last meeting of the IRG (International Research Group for Wood Preservation), Stockholm, Sweden, was discussed by Elmer Schmidt. This organization is a forum for new ideas on wood-destroying organisms. The general areas are: (1) biological problems (fungi and insects), (2) testing methods (bioassays), (3) marine preservations , and (4)??.

Future of Forest Products Entomology - Michael Haverty

1. Continued assessment of new soil termiticides with advances in their application for increased efficacy and longer effective life.

2. Assessment of non-chemical, physical barriers for prebuilding protection.

3. Better understanding of the taxonomy of the economically-important termites in the US--primarily Reticulitermes and Coptotermes.

4. Accelerate research on foraging behavior and related colony demography - increased understanding of feeding behavior

5. Related to 4 increase our understanding of the physiology and behaviors involved in feeding by subterranean termites: attractancy, repellency, and seasonal trends.

6. Study the biochemical mechanisms related to repellency to enhance structure protection and counter the avoidance of toxic baits. Also continue to study the behavioral/biochemical basis of intra- and interspecific agonistic behavior in termites.

7. Continued refinement of the bait/toxicant approach to subterranean termite control based on technological advances from areas above.

8. Reassessment of mirex as the toxicants with baits.

o Joe Mauldin discussed the status of wood treatments with borates as a preventative treatment. Jeff Morrell (Oregon State), Terry Amburgey (Mississippi State University), Lonnie Williams (USDA Forest Service, Gulfport) are the primary investigators. Borates can be applied by diffusion into green (wet, moist) wood. High concentrations of borates on on the wood surface diffuses into the center of the wood. Pressure treatment may be used after the wood is dry. There is also possibility of injecting low concentrations into live trees in hopes of protecting wood after harvest. These treatments are effective against termites, beetles, and many fungi. The treatment is targeted for woods which will be protected from moisture, because borates can be leached from the wood. Non-target effects are a concern if borates in high concentrations are misused. Borates are the major ingredients in household products such as Visine and Borax 20-mule team detergent.

o Joe Mauldin also discussed other Gulfport research projects directed at methods of protecting wood in use.

1) Borates (see above).

2) Wood extractives (natural preservatives in woods) are being investigated by Skip McDaniel. Chemicals are extracted and isolated and toxicity measured. Most of the toxic chemicals identified thus far are terpenes and alkaloids.

3) Baiting systems for termites (Susan Jones). Investigations are underway in Arizona for Heterotermes and in Gulfport and Florida for Reticulitermes. Some of the borate compounds appear to have promise in bait systems.

4) Traditional termite control with soil toxicants (Brad Kard). He screens insecticides to find those with promise for long life in soil as termite barriers. They have test sites all over the United States. Kard is also

field-testing plastics with slow-release pesticide and crushed basalt as termite barriers.

o Mike Haverty made a comment about an observation he (and Joe Mauldin & Nan-Yao Su) made in Southeast Asia. In the urban areas in Southeast Asia, they have stopped building with wood; they use cement for the load-bearing parts of structures and use wood only in roof structures, window and door frames, or in ornamental situations where it could be easily replaced. Most of the structurally-important wood used in SE Asia is either naturally durable or pressure treated.

o Mike Haverty asked Joe Mauldin for his assessment of the future of soil pesticides. Mauldin emphasized that the Gulfport lab will continue to conduct research on alternatives to currently registered soil insecticides. In the near future control of subterranean termites will mostly be accomplished with soil insecticides. Additional areas of subterranean termite control include biological control. Fungi, bacteria and nematodes work well in the lab but in the field these agents are not as effective. Termites apparently have a defense, or way to fend off these treatments, which renders them ineffective in the field. Dogs are also now being used in termite control. Their (the dogs) ability to detect termites in a structure has not been tested, but they appear to be effective.

o Vernard Lewis inquired about closer scrutiny and possible ban of fumigants in California. Apparently state regulatory officials are clamping down on use in structures and in wood yards. Ken Grace mentioned that there is a movement to register methyl bromide for fumigation in structures in Canada. Nan-Yao Su reported that Dow Chemical Co. requested tests of sulfuryl flouride to satisfy EPA. The goal of this research is to quantify the release of this fumigant from treated structures to support reregistration.

o John French, Joe Mauldin, Nan-Yao Su, and Ken Grace discussed the future of bait/toxicants for subterranean termite control. Nan-Yao reviewed the basic concept. Over the past 40 years, we have been relying on widespread use of huge quantities of pesticides to control subterranean termites. With bait toxicants, termites bring the toxicant back to colony, disperse the chemical, toxin or biologically-active agent to colony mates and cause the death of the entire colony. Until recently it has been difficult to determine whether termites simply move away or are killed by the bait. Dr. Su feels it is crucial to monitor activity of foraging populations of field colonies by the mark-release-recapture technique BEFORE we apply test toxins. Chemicals under examination currently are: (1) borates, (2) A-9248 (Abbott Labs), and (3) sulfluramid (Griffin Corp). A-9248 reduced a C. formosanus colony from $3.6X10^6$ to $75X10^3$ termites. Sulfluramid has toxicity, effective lethal time and acceptability to termites comparable to mirex. Sulfluramid is registered for use in baits for cockroaches and fire ants. Su wants to emphasize that we are recommending use of bait toxicants to suppress termite populations in urban areas NOT IN FORESTS.

o Mike Haverty discussed his work and that of Susan Jones and Nan-Yao Su on the disruption of caste structure and demography of colonies. Insect growth regulators induce molting to superfluous soldiers and intercastes. The goal of this control strategy is to cause the termite population to crash due to an

excess of dependant castes. This strategy works in lab but, so far, not in field. Coptotermes can tolerate as much as 50-60% soldiers.

o Ken Grace has begun work to quantify Reticulitermes flavipes populations in southern Canada. He has determined that the colonies are as large as $3X10^6$ with extensive foraging territories. He will soon be moving to the University of Hawaii to study means of controlling the Formosan subterranean termite. He looks forward to a 12-month, warm field season!

o John French discussed his work in Australia with mirex in baits. Mirex blocks kill a mound of Coptotermes lacteus in 6 to 10 days. The system appears to be equally effective in buildings. He further emphasized that a bait/toxicant system must be foolproof to be used effectively by pest control technicians. The advantage of these systems is that they would use small amounts of pesticides, localized placements of pesticides, and the unused remnants can be withdrawn after control has been achieved and disposed. It is sometimes necessary to practice "drastic carpentry" to place termite baits in the foraging path of the termites. With Coptotermes acinaciformis mirex-agar-sawdust baits work in Sydney but not in Melbourne. There is obviously a behavioral or species difference. Another approach still used in Australia is to puff a toxic powder into termite galleries or where they aggregate. This strategy relies on the grooming behavior of termites to disperse the toxicant throughout the colony. Arsenic trioxide is still allowed in Australia. Inclusion compounds in peanut-shaped molecules can be used to dust termites. When ingested during grooming the chemical becomes active and kills the termites.

o Finally, Mike Haverty made his pitch for chemotaxonomic research on termites. It was the consensus of the group that one of the areas of concern is the Pacific Rim. Coptotermes species are probably the most economically important termites. We need to study this group extensively. Another group of ecologically-important termites are the Nasutitermes, as well as other tropical groups. Our understanding of deforestation will be greatly enhanced by ynowledge of the wood-destroying (or wood-recycling) and herbivorous termite species.

SPECIAL PAPER ABSTRACTS

STEREOSPECIFICITY OF PHEROMONE PRODUCTION AND RESPONSE BY PINE ENGRAVER BEETLES IN THE GENUS IPS

Seybold, Steven J., Toshikazu Ohtsuka, David L. Wood, and Isao Kubo
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Since the isolation of the first beetle pheromone by extraction of the frass of Ips paraconfusus Lanier some combination of the compounds ipsenol (2-methyl-6-methylene-7-octen-4-ol) and ipsdienol (2-methyl-6-methylene-2,7-octadien-4-ol) has been found in every species examined in the genus. We have isolated ipsenol and/or ipsdienol from most previously studied North American species (I. pini, I. avulsus, I. grandicollis, I. confusus, I. paraconfusus and I. calligraphus) and from the unstudied species I. latidens, I. spinifer, I. mexicanus, I. emarginatus, I. plastographus, I. tridens, I. lecontei, and I. montanus using Porapak trapping of volatiles from infested logs and normal phase HPLC analysis of the extracts for quantity and stereochemistry. This survey represents eight of the nine subgeneric groups defined by S.L. Wood in 1982. In all species except for I. tridens (tridens group) males produced at least one of the two compounds. In collections from females alone, only I. latidens females produced one of the compounds (92%-(+)-ipsdienol). Where it occurs in the genus, the enantiomeric composition of ipsenol is always greater than 99%-(-). In contrast, the enantiomeric composition of ipsdienol ranges from 1.4%-(-) to 99%-(-). Ips spp. that colonize the same host have unique stereochemical blends of opsenol and ipsdienol.

The response of two species, I. latidens and I. pini, was examined in the laboratory and field, respectively. In the lab, female I. latidens responds to >99%-(-)-ipsenol producted by the male, but the response to opsenol is inhibited by 92%-(+)-ipsdienol produced by the female. In the field, I. pini can discriminate between solutions of 99.0%-(-) and 99.9%-(-) ipsdienol.

ABSTRACT

Observations of *Armillaria* in a stand of lodgepole pine.

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Twenty-three mature lodgepole pine trees were excavated to: (1) examine the extent of *Armillaria* on host tree root systems, and (2) gather data to test the effectiveness of different sampling strategies. Twenty of the trees were located on the Wasatch National Forest in northern Utah in a high-elevation (2880 m) stand known to contain the disease. These trees ranged in age from 115 to 237 yr with an average d.b.h. of 15.5 (+/- 2.3) cm and height of 12.0 (+/- 1.3) m. The remaining three trees were located in a disease-free lodgepole pine stand on the USU College of Natural Resources School Forest near Logan. The physical characteristics for these trees is the same as for the others except that their average age was 69 years. All trees were "healthy" and free of obvious symptoms of disease or insect attack.

Excavations were conducted by placing a 3 X 3m plot around 2 to 5 trees. The plots were further subdivided into 20 X 20cm cells for the purpose of surveying and mapping the root systems. Each root within these cells was assigned to one of six infection classes. Approximately 432 m of roots larger than 0.5 cm in diameter were examined, 74% of them belonged to a tree within the plot. Only root segments with mycelial fans of *Armillaria* were considered infected.

For the plots, 8-29% of the tree root lengths were infected. Individual tree infection ranged from 4-52% of the root length examined. None of the trees in the infected plots was free of the disease. Some trees showed advanced fan development at their base and along several main roots without exhibiting symptoms.

We are now testing the effectiveness of three different root rot sampling methods. The first is to excavate one or several main supporting roots to a specified distance from the base of a single tree. Another is to randomly or systematically sample using small excavations over a specified area. The third uses a model which simulates an infected root system to test the effectiveness of trap log, small area excavation, or other sampling strategy.

A SUCCESSFUL PHEROMONE BLEND FOR MANIPULATING SPRUCE BEETLES (Dendroctonus rufipennis)

H. Wieser, E.A.Dixon,A.A.MacKenzie*,H.F.Cerezke,R. Werner

Intensive spruce bark beetle pheromone baiting trials were conducted in southeastern British Columbia, northern Alberta, and Alaska during 1987 and 1988. The major objectives of these trials were to improve the currently commercially available lure, and to optimise the release rates and operational release devices.

The trials used both funnel trap and tree bait methodologies, and were specifically designed with particular integrated operational pest management strategies in mind. Population monitoring in both endemic and outbreak situations is of prime concern to the forest manager. Several of these trials successfully demonstrated the monitoring capabilities of these systems, and in most instances displayed a very high degree of selectivity by the attacking beetle. Pre-logging concentration baiting was another management strategy investigated successfully.

Details of these studies; the chemicals; release devices; experimental design; and the results will be presented.

OCCURRENCE AND IMPACTS OF ROOT DECAY FUNGI IN PRECOMMERCIALLY THINNED AND UNTHINNED WESTERN HEMLOCK

DAVID SHAW

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Occurrence and impacts of Heterobasidion annosum, Armillaria sp. and several unknown root decays were investigated in precommercially thinned, precommercially thinned with borax applied to cut stumps (to prevent H. annosum colonization), and unthinned stands of 35 year old western hemlock (thinned 20 years before present) near Clallam Bay, Washington. Three tenth acre plots of each treatment were sampled. Percent of trees with infections were:

Treatment	Annosus	Armillaria	Unknown	Total
Unthin	2.9	0.0	3.8	6.7
PCT	4.7	4.3	10.5	19.5
PCTw/borax	11.2	7.1	1.2	19.5

Percent of volume decayed was: unthin - .03%, PCT - .12%, PCT with borax - .96%.

Do bark beetles need to kill trees? : a reconsideration of the role of vectored fungi.

Kenneth R. Hobson

The mechanism of the death of trees attacked by tree-killing species in the genus *Dendroctonus* has never been fully understood. A close mutualistic symbiosis between the beetle and its vectored fungi has been postulated. With westen pine beetle, *Dendroctonus brevicomis* however, the timing of the infection of the sapwood of the attacked tree does not support the idea that this process is necessary for the success of the beetle. Using clumps of naturally - attacked or baited ponderosa pines we have started a sequential sampling of trees infested with beetles at the same time together. At regular intervals we have cut trees with successively older attacks and placed them either intact or sectioned into bolts in buckets of aqueous fast green dye to assess the proportion of the sapwood which is healthy and still conducting water to the crown.

The sections which we obtain from these trees exhibit a predictable pattern of progressive occlusion from healthy completely green stained active sapwood at two weeks to the development of an outer occluded region of the xylem unstained by dye which grows inward until by 4 to 6 weeks little or no dye is conducted in the bole. In this sequence the first visible blockage of the sapwood does not appear until the eggs of the attacking adults have hatched and the larvae have matured through to second or third instars At this point the larvae have left the interface of the xylem and phloem to feed further out in the outer bark of the tree.

This sequence suggests that the progeny beetles may already be safe - removed from the region where defensive resins would be produced - before the xylem is infected. If this were the case the rapid death of the tree by fungal infection might be simply incidental to the beetles' success (although the consumption/ destruction of the phloem by the beetle brood would lead to the trees' ultimate demise.) The role of the fungi in this instance would be more as an opportunistic commensal associate of the beetles rather than as an obligate mutualist. A tree devastated by beetles could maintain a green crown if fungi could be excluded from the xylem.

A test of this hypothesis is being conducted by injecting trees with a fungicide, thiabendazole - then inducing beetle attack upon them with pheromone baits. If beetle brood production is similar in these trees to untreated attacked trees and the crowns of the trees are kept alive and green for a year after the attack we will have clear evidence that fungal colonization of the xylem is not a necessary prelude to successful beetle reproduction.

It is still possible that the fungi may play some essential role in conditioning the phloem (which is not exposed to the fungicide) that is required for beetle success - either neutralizing some toxic factors or enhancing its nutritive quality.

With these tests it may be possible to identify the relationship of the fungi with the beetle as either obligate or opportunistic. Its appears whichever is the case that it is the occlusion of the sapwood that causes the tree's death (based on the fact that crown symptoms of ensuing mortality do not appear until the sapwood is >80% occluded.) What is less clear is the means by which this occlusion is accomplished. Is it:

-by physical blockage of the tracheids and vessels with fungal hyphae?
-by disruption of the water column and production of gaseous embolisms in all the water conducting vessels in the sapwood?
-or perhaps by production of a toxic substance by the fungi which may diffuse out into living parts of the tree to kill tissues required for the translocation of water?

In order to discriminate between the first of these two possibilities and the third we are taking samples of the different regions of our disks: the outer undyed non-conducting area and the inner green-dyed healthy sapwood. We are isolating from these samples to determine if fungi are routinely present in non-conducting areas and absent in healthy tissues. In addition to establishing the presence or absence of fungal infection we hope to decipher which fungi are most likely to be responsible for the tree's death.

APPLICATION OF CHLOROPICRIN TO LAMINATED ROOT ROT INFECTED STUMPS: A STARTING POINT

Walter G. Thies

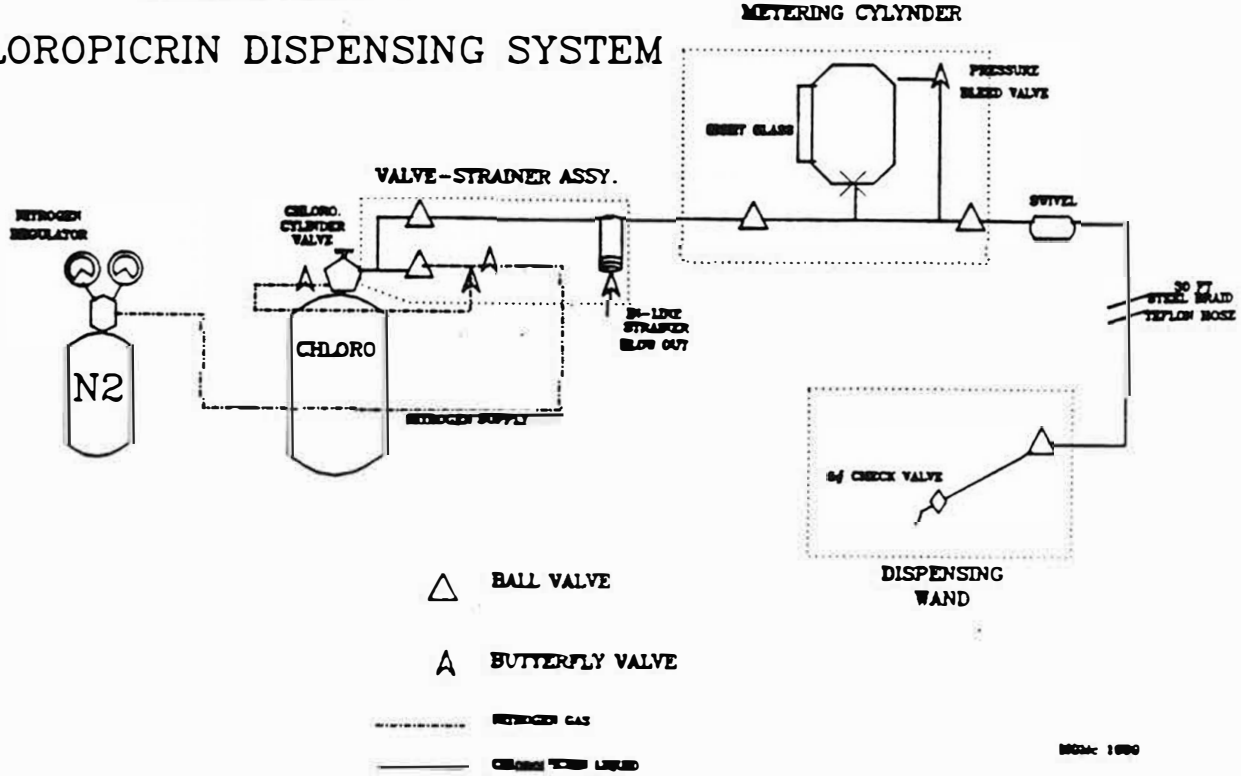
Laminated root rot is widespread and causes significant losses to conifer species. Infection in a young stand begins when roots of young trees contact residual infested stumps and roots. The use of chloropicrin, a common soil fumigant, was approved in January 1989 by the EPA for application to Douglas-fir stumps for control of laminated root rot. The fumigant permeates the wood and kills the pathogen thus preventing infection in the succeeding stand. The following describes application equipment, assembled with "off-the-shelf" hardware for a recent study, that may be useful for operational applications:

Drill a minimum of two treatment holes vertically into each stump top, 5 cm in from the bark and roughly every 15 cm around the circumference of the stump. Holes extend only slightly below the soil line. Distribute a dose of chloropicrin equally to all holes in a stump. After fumigant application, plug each hole tightly with a hemlock dowel. One end of each plug has a bevel (facilitates driving), coated with resorcinol glue (resists passage of the fumigant), and the glue allowed to harden before the plug is used.

Dispense chloropicrin from a tank through a closed system of steel-braid-coated, teflon-lined hoses to the stumps. Chloropicrin is moved, measured, and dispensed as a liquid by using high pressure nitrogen to pressurize the chloropicrin tank. The liquid moves into the bottom of a closed metering cylinder thus compressing gas in the cylinder. Later, this pressure will force the chloropicrin from the metering cylinder through a hose to the dispensing wand and into a stump. Volume of chloropicrin in the metering cylinder is determined from a sight glass and the flow is regulated using brass ball valves.

SCHEMATIC OF

CHLOROPICRIN DISPENSING SYSTEM



CLARIFICATION ON THE USE OF ":", "EX" AND DOUBLE "II" IN BOTANICAL NOMENCLATURE

R.S. Hunt, Forestry Canada, Victoria

Over the past couple of years I have reviewed some papers, or tried to write papers, where there seems to be confusion on the use of ":", "ex" and "ii" in nomenclatural citations. I have tried to clarify their use below.

Use of ":"

The 1981 Code (Korf 1983) replaced the use of "ex" for sanctioning authors only, i.e. Persoon 1801, for rusts, smuts and gasteromycetes, and Fries 1821-1832 for many other fungi (see Greuter 1988, Recommendation 50E); while, "ex" is still used for later described taxons. For example Botryis cinerea, neither a rust nor a smut, was first described by Persoon and later sanctioned by Fries and prior to 1981 was commonly written as B. cinerea Pers. ex Fr., or shortened to B. cinerea Pers., but now is B. cinerea Pers.:Fr. or shortened to B. cinerea Pers. Between 1950 and 1981 only Fries' work of 1821 was sanctioned, i.e. a fungus cited in a Fries volume between 1822-1832 had no special status, so other citations such as B. cinerea Pers. ex Nocca et Balb. were legitimate, because B. cinerea was cited by Fries after 1821; however, this was rectified in the 1981 code making citations such as B. cinerea Pers. ex Nocca et Balb. illegitimate. For further discussionon this see Korf 1983 and make use of citations in WIFDWC's Common names for tree diseases (Hawksworth et al. 1985) for which Bob Gilbertson has up-dated the author citations to the newer code.

Use of "ex"

There are considerable errors in the use of "ex", particularly for hosts. Hopefully these will be corrected in Flora of North America. I believe these errors occur because many foresters who have authored such texts as Silvics of Forest Trees of the United States (Fowells 1965) and Native Trees of Canada (Hosie 1973) have not followed the International Botanical Code, but have largely followed other taxonomic authorities. Subsequently several floras have followed these texts, or also the taxonomic authority. The ultimate taxonomic authority for these works seems to have been E. Little (1944; 1953; 1979). In 1944 he usually used the shortened author citations for species; while, in 1953 and 1979 he usually used the full citation. I find that he did an excellent job and rarely made errors. The problem is that the code was updated several times between these publications. For example. the full citation for Pinus ponderosa and P. monticola are P. ponderosa Douglas ex Lawson and P. monticola Douglas ex. D. Don which we have shortened to P. ponderosa Laws. and P. monticola Doug. Obviously one of these shortened versions is incorrect since the former leaves out the name before ex and the latter that which occurs afterward. In the 1935 code (Camp et al. 1948) which is what Little was using in 1944, the author which appeared immediately following the specific epithet was the one who

first used the name. We all know David Douglas collected many of our western conifer taxons and named them in his herbarium packets as he sent them back to the U.K. Later codes deemed that the author immediately following the specific epithet was the one who first described the taxon. David Douglas was killed by a trapped pig in Hawaii before he could get back to the United Kingdom to describe any taxons; except for his mailed-in description of sugar pine (Douglas 1827). His name can appear in a long citation only followed by "ex" if the describing author attributes the name to him (Greuter 1988, Art. 46.3). All shortened forms cannot have only Douglas because the "ex" and whatever is before it should be omitted. Douglas's name as an author of a taxon affects our use of amabilis fir, grand fir, lodgepole pine, digger pine, western white pine and garry oak. The proper short citations of these are Abies amabilis Forbes, A. grandis (D. Don) Lindl., Pinus contorta Loud., P. sabiniana D. Don, P. monticola D. Don and Quercus garryana Hook., respectively.

In a manuscript I recently submitted, I used Cronartium ribicola J.C. Fisch. ex Rabenh., i.e. the full name as used by Ziller (1974), but after review I was told to shorten it to C. ribicola J.C. Fisch., which is how the name appears in our common name list (Hawksworth et al. 1985). This of course was contrary to the rules, but C. ribicola Rabenh., did not look correct. In checking further I found that "ex" should not have been used by Ziller, but the long form should be C. ribicola J.C. Fisch. in Rabenh., for Fischer not only named the pathogen but described it in Rabenhorst's book; therefore, the correct short form is C. ribicola J.C. Fisch. (Greuter 1988, Art. 46.2).

Another mis-use of "ex" is in the example Abies bracteata D. Don ex Poiteau (Little 1979). Little's 1953 text was compiled at a time when "ex" was out of favour and the first author was placed in parenthesis. When the 1979 text was done "ex" replaced many of these parenthesis. However, in the case of A. bracteata "ex" should not have been used, since Don had legitimately described the tree as well as named it. Don described the tree in the genus Pinus and Poiteau placed it in Abies; therefore, it should be cited as A. bracteata (D. Don) Poiteau (see Greuter 1988, Art. 49)

Use of "ii"

The double "ii" used for normal masculine words in Latin indicates "possession" (genitive case). However, there are many - many exceptions to the rule depending on the root word. For instance "ir" and "er" endings frequently take a single "i" for "possession". Fortunately, botanical Latin (see Greuter 1988, recommendation 73) has been simplified for specific epithets, so that, exceptions take the single "i" ending only when the personal root name ends in a vowel, "er" or is already a Latin or Greek name which may normally take only a single "i". Since "w" was not in the Latin alphabet, "Weir" and "Wagener" are modern names and do not follow classical Latin rules. Weir's Phellinus follows the botanical rule for ending in a consonant and becomes P. weirii; while Wagener's Leptographium follows the exception rule and becomes L. wageneri.

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PANEL DISCUSSION: INDUCED DEFENSES IN PLANTS AND THEIR ROLE IN PLANT-PEST INTERACTIONS.

Moderator: Michael R. Wagner, Northern Arizona University

Participants: Bill Otrosina, U.S. Forest Service PSW Berkeley
C.J. De Mars, Forest Airphoto Analyst
Evan Nebeker, Mississippi State University

Induced defense in plants is a relatively recently recognized phenomenon of potential importance to forest pest management. Induced defense (also called induced resistance) is the qualitative or quantitative enhancement of a plant's defense mechanism against pest as a result of extrinsic physical or chemical stimuli. In many cases this extrinsic stimulus is feeding by an insect herbivore. Thus a common example of induced defenses is when insects feed on plants and the plants modify or enhance their defenses to reduce further damage.

Michael R. Wagner, Induced defenses in trees to defoliating insects.

Several biochemical changes occur in ponderosa pine as a result of previous feeding damage. Mechanical defoliation of pine seedlings significantly increased the levels of phenols, tannins, and protein. Similar treatments of trees under field conditions resulted in reduced levels of tannin and nitrogen. These induced changes in general had significant negative effects on several pine sawfly feeding parameters. These factors strongly suggest that induced resistance reactions occur in ponderosa pine and that these factors could influence population dynamics. A variety of factors are known to influence the induced resistance in ponderosa pine including: tree age, stress, and tree phenotype. Future work on induced resistance should elucidate the relative importance of these general phenomena in explaining tree-insect interaction patterns in nature.

William J. Otrosina, Host response to Trichosporium Symbioticum, pathogenic fungus vectored by the fir engraver beetle.

The study reported here details some preliminary investigations on the environmental and genetic components of host resistance to the fir engraver beetle and the pathogenic fungus it vectors. The bark beetle, Scolytus ventralis vectors the fungus Trichosporium symbioticum, producing a characteristic resinous lesion on the host. Under conditions of high stress, such as drought and root disease, beetle populations can be

explosive and become a powerful ecological force. In a greenhouse study, water stressed white fir seedlings had a less defined reaction to inoculation of the fungus than did non-stressed seedlings, which had twice the pentane extractable resin content. Also, the fungus could not be reisolated from stressed trees, probably indicating unsuitable nutritional conditions for the fungus.

Isolations from emerging S. ventralis beetles obtained from bolts of infested white fir revealed several genera of fungi in addition to T. symbioticum. One fungus, believed to be Spicaria anomala, was present in low frequency and has not been previously reported as an associate of S. ventralis. S. anomala is antagonistic to T. symbioticum in paired agar culture. Further studies are underway to define the roles of these fungal-bark beetle associations, including isozyme structure of beetle and fungal populations from various geographic areas.

C.J. DeMars, Jr. U.S. Forest Service, Ret. Host-insect/disease interactions in drought-stressed white fir stands at Lake Tahoe, California.

Below normal precipitation over the last three years has created severe moisture stress in heavily stocked white fir, Abies concolor, stands on glacial moraines at Lake Tahoe in central Sierra Nevada. Populations of the dir engraver, Scolytus ventralis have increased to outbreak proportions. A study was established by George Ferrell, Bill Otrosina, and I to investigate the interrelationships among crown/stem characters, tree physiological and pathological conditions, and the susceptibility of individual trees to attack by fir engraver and the net beetle productivity in trees of different characteristics and conditions.

The crown and stem characters Ferrell has found useful were augmented by sapwood basal area growth and the phloem reaction to inoculation with Trichosporium symbioticum. Dying trees were examined for symptoms of Heterobasidion annosum and cultures taken for laboratory analysis. Infested trees in four crown classes were sampled to estimate the beetle productivity (emergence/attack) of the fir engraver.

In 1984, stocking averaged 447.7 ±211.7 live trees per acre. Tree mortality per acre from 1985-87 was as follows: 0.8 ('85), 7.6 ('86), and 6.0 ('87) -- mostly in the dominant and codominant classes. Diameters averaged about 33 cm with no differences among years. Wound reaction lengths varied among the crown classes as follows: 20.04 cm and 20.63 cm in the dominant and codominant crown classes were significantly longer than 16.65 cm and 14.12 cm for the intermediate and suppressed crown classes. This seemed to indicate that trees with the larger crown masses suffered from the drought more than the understory trees of this shade tolerant species. This result differs markedly from what has been reported for the shade intolerant hard pines. Perhaps

also, the smaller trees are growing under such poor conditions that they are unable to respond to the drought.

Beetle productivity was greatest in the intermediate crown class trees averaging 5.62 ± 2.28/attack and 8.89 ± 2.98/attack in 1986 and 1987 respectively. Although total production was greater in the larger dominant and codominant trees, productivity per attack was lower, averaging 3.79 ± 0.88/attack and 4.12 ± 1.05/attack in dominants in 1986 and 5.57 ± 1.55/attack in 1987. Productivity in codominant trees was 4.12 ± 1.05/attack in 1986 and 5.37 ± 1.19/attack in 1987. Productivity in suppressed trees averaged 2.74 ± 0.97/attack in 1986 and 2.71 ± 2.71/attack in 1987. Productivity in individual trees was often negative, the tree functioning as a net sink. Clearly, outbreaks of the fir engraver can only be launched by mortality in the larger tree size classes.

PANEL: BIOTECHNOLOGY IN FOREST DISEASE AND INSECT RESEARCH: POWER, PROMISE AND PITFALLS

Moderator: Marge Palmer, USDA Forest Service

Participants: Steve Strauss, Paula Spaine, Bob Stack, Bob Scharpf and Jim Stewart.

When the opportunities offered by biotechnology in forestry research were first recognized, many enthusiastic claims were made regarding the power of these techniques. Pest resistant trees could be developed in months! Square trees, ready for the lumbermill, could be engineered! As we know, many of these goals are not realistic or may just take longer to achieve than originally anticipated. The objective of this panel was to present a balanced overview of the promise and pitfalls of using biotechnology techniques in forest disease and insect research. Following are summaries of each speaker's presentation.

Advances in Forest Entomology Research--Steve Strauss, Oregon State University

There are opportunities for enhancing insect resistance of forest trees by genetic engineering. Some of these, such as insertion of toxin genes from Bacillus thuringiensis (BT) and insertion of proteinase inhibitor genes from plants, are currently being pursued. Other strategies will require more information before their feasibility can be assessed. Insertion of BT genes into agricultural crops has by-and-large given good results. Monsanto reported that modifying the DNA sequence (but not the amino acid sequence) of BT to more closely resemble that in plants markedly increased gene expression and insect toxicity. A number of labs are working on insertion of BT toxin genes into trees, but have not yet studied toxicity to insects. Brent McCown and associates at the University of Wisconsin have regenerated poplar trees that contain the BT gene and are beginning feeding tests with gypsy moth and tent caterpillar. In our own lab, we have successfully inserted the BT gene into cultures of poplar using Agrobacterium and into Douglas-fir using DNA-coated microprojectiles. We have found that insects successfully feed on tissue cultures, so a first step in testing toxicity will be to feed insects directly on transformed cultures. Several more labs in the U.S., Canada and Europe are expected to test the BT gene in a variety of tree species within the next few years.

The greatest limitations to the use of genetic engineering technology in forestry are 1) poor knowledge of the molecular biology of insect development, insect pathogenesis, and plant defense against insects; 2) inefficient systems for insertion of genes and regeneration of engineered plants; and 3) the risk of insect counter-evolution to overcome the effects of engineered resistance genes. In the short run, the greatest benefit from recombinant DNA technology will be to provide new avenues for understanding tree-insect and insect-pathogen interactions, and thus new options for combatting insect pests.

Advances in Forest Pathology Research--Paula Spaine, USDA Forest Service

Forest pathologists are taking advantage of the opportunities offered by the new techniques of biotechnology to solve old problems. Researchers are examining ways to manipulate both host and pathogen with the objectives of increasing our knowledge of host/parasite interactions and developing disease resistant trees. Most research focuses on selecting the genes of special value or interest, getting the genes into the tree and/or propagating trees containing special genes or traits.

The research program of Henry Amerson and others at North Carolina State University provides a good illustration of the gains that have been made in the area of plant propagation. These researchers have made significant advances in developing somatic embryogenesis in Norway spruce and loblolly pine. The long term objective of the research is to develop an embryogenic protocol that will allow genetic alterations and mass cloning of the genetically new plants. Forest pathology researchers will be able to use these cloned plants to examine the differences between physiological and genetic responses to infection.

In our laboratory, we are using biotechnology techniques to study the genetics of virulence in Cronartium quercuum f.sp. fusiforme, the cause of fusiform rust. George Kuhlman and Fred Matthews are examining the amount of variation in virulence of lines derived from a single aecieospore. My own research is concentrating on producing colonies from single basidiospores. These single genotypes will then allow us to study variation in pathogenicity in the fungus population on cloned or mixed hosts. We also hope to use these new tools for propagating the fungus to study the mating types in the population.

Pitfalls in Use of Biotechnology in Forest Disease and Insect Research--Bob Stack, North Dakota State University

There are several pitfalls that need to be avoided when applying biotechnology techniques to develop disease or insect resistance in forest trees. Agronomists learned that breeding genetically uniform plants, planting in monoculture, and relying on single gene resistance was disastrous when pests quickly overcame these resistance mechanisms. Also, intensive selection for resistance to a single disease or insect has sometimes resulted in the inadvertent loss of resistance to another. Stability of resistance must be a major, if not the overriding factor in developing pest resistance. Instability of specific resistance is of particular concern in reference to biotechnology because this type of resistance is the one most likely (although not the only type) to be detected in vitro or generated by somoclonal variation or genetic engineering methods. Use of in vitro methods limits sources of resistance to only those genes detectable in such tests, substantially reducing the genetic resource available for use.

Most pitfalls can be avoided by using the time-tested system of extensive trial plantings prior to wide-scale deployment of new

genotypes. When disease or pest resistance selection is carried out in field plantings, provenance trials or disease nurseries, accurate comparisons can usually be made since they are based on the actual insect or disease of interest--provided they are present at sufficient levels. These trials subject trees to a wide range of pests and diseases under many environmental conditions. If inadequately tested, trees may 1) be attacked by new races of pathogens; 2) be highly susceptible to previously unimportant pests or diseases; 3) have lost general resistance to pathogens or pests in the process of selecting specific resistance; 4) may have been selected for an in vitro artifact rather than disease or insect resistance. These pitfalls were discussed extensively in a recent review paper (Stack, R.W., 1987. Proc. V. North Central Tree Impr. Conf. pp 72-81).

The Role of Biotechnology in a Balanced Forest Insect and Disease Research Program--Jim Stewart and Bob Scharpf, USDA Forest Service

There are two main areas of biotechnology research. One is the development of the technology itself and the other is using it to achieve some pest management objective. The U.S. Department of Agriculture, namely the Agriculture Research Service and the Forest Service, has a major role to play in both of these areas. These agencies need to be aggressive in capitalizing on what biotechnology offers in protecting our Nation's agriculture and forest resources. This is not to say that the more traditional aspects and approaches to science should be deemphasized.

The Forest Service's 10-year plan for forest insect and disease research calls for two or three centers for fundamental research directed at developing biotechnology. Applied aspects of biotechnology will be done wherever appropriate. The plan also calls for a continuation of traditional insect and disease research including an increased effort in fundamental research aimed at improving our basic understanding of pest organisms, their hosts, their natural enemies, and the ecological and environmental interactions.

We talk about a balanced program. If the forest insect and disease research program is going to be responsive to the forest manager's needs, we must increase the entire program including biotechnology, traditional basic research areas and applied research. However, we all know that in this time of Federal budget woes, general increases are not to be expected. Therefore, the process of developing budgets will pick and choose and determine the balance. Unfortunately, that process is complex and certainly not based purely on science. Whether or not the resulting program is balanced in your eyes depends on who you are and your criteria for judging. The only thing that we can say is that biotechnology offers fantastic opportunities for making significant advances in the science of pest management. Because of this, we must aggressively develop and use this technology while actively pursuing other needed and productive lines of research. Given this and with some monitoring, at least at a gross level, the balance will hopefully take care of itself.

WORKSHOP: ESTIMATING AND PREDICTING MULTIPLE PEST IMPACTS IN FOREST STANDS.
Moderators: M. Marsden and P. M. Hall
Participants: S. Hagle, B. Eav, T. Greg
Attendance: Approximately 30 people attended the session.

This workshop was split into two separate discussions: 1) estimating, which deals with survey and assessment methodology; and, 2) predicting, which implies the use and application of various models.

Mike Marsden began the discussion by summarizing some of the data needs for the two aspects and emphasizing that the objectives of any evaluation will dictate the type of information required. Estimation of impacts requires that data be assembled on the host, the pests, the type of damage being sustained, and the inventory. Prediction will estimate the damage over time and requires information on both host and pest complex dynamics. Prediction models require both host and pest components.

Sue Hagle discussed data acquisition through field surveys. Most importantly, field crews must be trained to recognize and quantify damage caused by a variety of pests. Existing USDA field survey forms can accommodate information on up to 3 different pests. However, supervisors must be able to monitor crews and specify what is needed and in what format.

Bov Eav discussed available pest models and their usefulness in dealing with multiple pests. The prime model in use is PROGNOSIS with it's subroutines for mountain pine beetle, Douglas-fir tussock moth, western spruce budworm, dwarf mistletoe, and root disease. The concern with the use of these submodels is that they were developed independently of each other and interactions are not known.

Tom Greg presented results of modelling mountain pine beetle and root disease in Region 6 using PROGNOSIS. The model was run once for each damaging agent and results were combined. The result indicated that the root disease may have reduced the total loss to the beetle by removing large diameter host trees before they were attacked. The ultimate use of this type of analysis is to provide pest damage input into forest planning processes. Models may be the best avenue for this integration but strong linkages between pest models, stand models (such as PROGNOSIS), and forest models must be set.

It was apparent that more effort must be directed to the consideration of multiple pests in both operational planning and forest planning.

WORKSHOP: INFLUENCE OF INDUCED CHANGES IN HOST NUTRIENTS AND DEFENSIVE CHEMISTRY ON INSECTS AND PATHOGENS

Moderators: Karen Clancy and Catherine Parks

Participants: Karen Clancy, Jim Entry, Salma Talhouk, Phil Wargo, plus an audience of 30-40 people

Jim Entry presented evidence that naturally established second growth Psuedotsuga menziesii trees in stands that were thinned and fertilized were more susceptible to Armillaria ostoyae infection than those in stands that received thinning or were left untreated. Trees in stands that received thinning to a 5 x 5 m spacing and fertilized with 360 kg/ha had higher concentrations of sugars and cellulose but lower concentrations of total phenolic compounds, protein precipitable tannins and lignin in root bark tissue than trees in stands that were thinned to a 5 x 5 m spacing or left untreated.

Phil Wargo presented information on some chemical changes in tree tissue induced by defoliation and drought and how they affected 1) growth of the fungus, Armillaria 2) metabolism of phenols and fungal growth, and 3) host-lytic enzymes. Changes in starch levels accompanied by increases in reducing sugars, especially glucose, and amino nitrogen enhanced growth of Armillaria in extracts from stressed tissues and on root tissues from stressed trees. Increased glucose and amino nitrogen enabled the fungus to oxidize a variety of commercial tannins and other phenolics in agar media and in extracts from bark of oak trees containing a variety of natural phenols. The addition of reducing compounds to the phenol media greatly inhibited growth of the fungus by preventing oxidation of the phenols. Stress may also reduce resistance to Armillaria by adversely affecting levels and or activities of lytic enzymes (B-1,3-glucanase and chitinase) that are produced by the host.

Salma Talhouk discussed how previous defoliation of 4 birch clones affected foliar nutrient levels and gypsy moth performance. Larvae feeding on previously defoliated, well-watered and water-stressed plants, had a lower relative growth rate. In well-watered plants, the change in soluble protein and nitrogen content of leaves following defoliation was not consistent among clones. P, Ca, Mg, and Fe levels were lower in defoliated plants, and were positively correlated with RGR of larvae. However, under water-stress conditions, levels of nitrogen and soluble proteins were lower in defoliated plants, whereas P, Ca, Mg, and Fe levels following defoliation varied with closely related plants and with different environmental conditions even though leaf quality decreased in all cases. Such results suggest that absolute values may not be sufficient to determine how changes in nutrients affect insect performance.

Karen Clancy reviewed data on concentrations of several nutrients in foliage from Douglas-fir trees that were phenotypically "resistant" versus "susceptible" to western spruce budworm defoliation. Susceptible trees had lower levels of sugar and higher ratios of P, K, Mg and Ca to N than resistant trees. The foliar concentrations of sugars and mineral/N ratios in the susceptible trees were closer to the optimum quantities predicted from budworm response curves to the nutrients. If the foliar chemistry of resistant versus susceptible trees is the consequence of induced chemical changes, it implies budworm defoliation may have a positive feedback for subsequent generations.

WORKSHOP: CURRENT STATUS OF B.t. IN THE WEST
Moderator: Roy C. Beckwith
Participants: Lorraine Maclauchlin, John Neisess, Jim Hadfield, Glenn Howe

Bacillus thuringiensis is usually the choice for forest defoliator control because of its insect specificity, environmental safety, and general public acceptance. General discussion by the participants revolved around the use of B.t. in Western North America since 1987.

The British Columbia Forest Service organized a program to determine how best to reduce losses in the interior Douglas-fir forests; and, to determine the efficacy of B.t. when used aerially to control the western spruce budworm. Efficacy was inconsistent in that larval mortality over the 3 years ranged from 26 to 95 percent in the different treatment areas. Results to date show a cumulative benefit in stands treated with B.t.; percent overstory defoliation was significantly reduced in all treated sites, especially when treated for successive years.

A resurgence of the Douglas-fir tussock moth in northern California resulted in about 7,000 acres of defoliation in 1987. In 1988, a pilot/field test using Thuricide 32 LV compared the efficacy of 16 BIU's per acre applied at the rates of 64 and 128 oz/a; population reduction varied from 88.6 to 92.5 percent at the 64 and 128 ounce dosage, respectively. Based on the 1988 results, an operational spray application was conducted in 1989 on about 83,870 acres using Thuricide 32 LV; the only formulation registered in California at 16 BIU's at the time the decision to spray was made. Application was made at 50 percent dispersal in an attempt to save current growth; the early application provided substantial foliage retention under dense larval populations.

About 600,000 acres were sprayed with four different B.t. formulations operationally or in pilot tests during 1988 to control the western spruce budworm. A pilot/field test using Foray 48B was conducted against this insect in eastern Oregon in 1989. The test compared the efficacy of 43 and 64 ounces/acre. Prespray densities averaged 24.5 larvae per branch; postspray densities averaged 4.8, 3.5, and 13.5 larvae/branch for the 43, 64, and 0 applications' respectively. The formulation presented no handling difficulties to the applicator.

A cooperative agreement between PNW and OSU is researching the insertion of the gene for the delta-endotoxin of B.t. into both Douglas-fir and hybrid poplar. The B.t. toxin gene and a linked reporter gene (GUS) are being inserted into Douglas-fir using the recently developed technique of "biolistics". Gene insertion into poplar is accomplished by using Agrobacterium-mediated transformation of suspension culture cells. Callus lines of both plants containing the toxin gene have been identified and will be bioassayed using suitable insects in the laboratory.

WORKSHOP: URBAN FOREST PEST MANAGEMENT
Moderator: Timothy D. Paine, Kenelm Russell
Participants: T. Paine, J. Miller, D. Nielsen, K. Russell, S. Dreistadt, and T. Vrabel

Fifty persons participated in the workshop, focusing on plant health care and communicating with the public about pest management problems of the urban forest. After short introductory remarks by T. Paine (U. Cal. Riverside, CA), Jeff Miller (Oregon State U., Corvallis, OR) discussed results of an extensive project on gypsy moth in Oregon. He tested 326 angiosperm and 29 gymnosperm species for acceptance as food sources for all stages of gypsy moth larvae. Young foliage of some plants was unacceptable but older foliage was consumed (e.g. avocado), while all foliage of other plants was always unacceptable. In the angiosperm group, 101 of 326 species were accepted by first instar larvae, 34 species by second instars, 9 by third instars, 1 by fourth instar, and 2 by last instar larvae for a total of 147 species. In addition, many of the gymnosperms (including deodar cedar, Colorado blue spruce, lodgepole pine, and Douglas-fir) were also acceptable. Acceptability may be related to nutritional content and presence of secondary metabolites.

Dave Nielsen (Ohio State U., Wooster, OH) identified the main concerns of professional arborists as aesthetics and vulnerability of plant material to insects and diseases. He focused discussion on the problem of selling pest management technology to users and suggested that an appropriate approach would be to advocate total plant health care. This more holistic approach would be preventive rather than remedial in focus.

Communication with public and private clientele was addressed by Ken Russell (Washington State Dept. Natural Resources, Olympia, WA) and Steve Dreistadt (U. Cal. Davis, CA). They reinforced emphasis on examining problems from the perspective of healthy plants rather than from individual disciplines. In tune with this theme, Ken Russell changed their department's Forest Pest Management Section name to Forest Health. (Tree/plant care people know their plants, but not necessarily the specific pests that attack them.) The simple name change conjures up a picture of healthy plants rather than a pest that is devouring them.

Use of brochures, television and radio news clips, and print media for the public at large, and training manuals or presentations to tree care professionals at pesticide licensing recertification programs provide topical information in a timely and effective manner. In most states, pesticide applicators must attend regular recertification programs which assures reaching a large portion of the professionals who deal with tree and plant health. Steve Dreistadt detailed some of the urban-focused biological control efforts that have been developed at UC Berkeley.

Tom Vrabel (Rhone-Poulenc Co. Triangle Park, NC) concluded this workshop by describing the re-registration of Sevimol (carbaryl) and the use of Florel for management of dwarf mistletoes.

WORKSHOP: TECHNIQUES FOR STUDYING DISPERSAL

Moderator: Bill Thoeny

Participants: Drs. Bill Thoeny & Peter Turchin, Forest Insect Research, USDA-FS, Southern Forest Experiment Station, Pineville, LA.

Bill Thoeny discussed two methods that are being used to mark southern pine beetles (SPB) for studies of movement and dispersal at the Southern Forest Experiment Station, in Louisiana. One method marks beetles internally with rubidium (Rb) by injecting pines with RbCl by several methods and rearing SPB within the Rb-enhanced inner bark tissues. Rb-marked beetles emerge naturally from these brood trees and their movement is determined by recaptures from a grid of pheromone-baited funnel traps. Rubidium is detected in the beetles by atomic absorbtion spectrophotometric techniques.

Fluorescent powders are also being used to mark SPB. Powder is applied to the bark of SPB-infested bolts and beetles are self-marked as they emerge. Several colors of fluorescent powders are available which allow various manipulations to be accomodated. Marked SPB have been collected over two km from the source of marked beetles.

Peter Turchin discussed analysis of mark-recapture data and how to characterize the rate of spread of marked insects from the distribution of recapture distances. He proposed a model that assumes that insect dispersal can be described by the diffusion equation. He explained that the spatial distribution of marked-and-released insects can be approximated at any given time by a bell-shaped normal surface, and that the width of the distribution (variance) increases with time. The model predicts the frequency distribution of recaptures as a function of distance from the release point. He explained that the model can be made more realistic by including information on wind parameters, habitat structure, and assumptions on mortality.

WORKSHOP: CHORISTONEURA DISTRIBUTION AND TAXONOMY
Moderator: George Harvey
Participants: Roy Shepherd, Tom Gray, Gary Daterman, Chris Sanders, George Harvey, P.T.Dang, Marion Page.

An informal workshop on this subject was held at the 1985 WFIWC meeting in Boulder,CO. The object of these workshops is to identify gaps in our understanding of the distribution and taxonomy of conifer-feeding Choristoneura and to foster and coordinate further work. Participants at Bend reported progress since 1985.

Roy Shepherd (Forestry Canada,Pacific Region,Victoria) Roy thanked: the USDA Forest Service, Alaska, the Forest Insect and Disease Survey (FIDS) in Alberta and British Columbia, and Dr. George Harvey, for assistance in placement of pheromone detection traps and for field collections of larvae which have been a tremendous asset in delineating the boundaries of the various species present and their distribution in British Columbia, Alberta, Northwest Territories, Yukon Territory and Alaska. He explained the diversity of habitats available to Choristoneura by showing the biogeoclimatic regions of British Columbia. He has been using two pheromone groups, acetates and aldehydes in a paired trapping system over a 9 year period to determine species distribution and has used the trapped moths for morphological and physiological testing. The four main criteria for separating species are: 1. Pheromones: moths respond to either aldehyde or acetate. 2. Hosts and geographic location: Abies/Picea, Pseudotsuga, and Pinus. 3. Adult morphology: wing colouration and pattern, and spicules on aedeagus. 4. Isozyme frequencies (measured by George Harvey). Roy showed SEM slides to illustrate how two species can be separated by the presence or lack of spicules on the aedeagus. Prior to 1967 all Choristoneura in B.C. were considered to be C. fumiferana but by 1980 there were thought to be four species and now we suspect there are eight or nine distinct species. C. occidentalis, C. biennis, and C. fumiferana all respond to the aldehyde pheromone lure. The other five or six species respond to the acetate pheromone lure.

Tom Gray (Forestry Canada,Pacific Region Victoria) There are two groups of acetate responders: those feeding on Picea/Abies and those on Pinus. C. orae is mainly a spruce feeder found in Northern B.C.,Yukon Territory, and Alaska and its pheromone has been isolated and identified. Although the female moth contains a small amount of aldehyde in her pheromone gland that component is not necessary in an attractant lure. There are possibly five species feeding on Pinus, but pheromones have been isolated and identified from only two: C. pinus and C.n.sp. C.pinus is not known from B.C.; its most westerly recovery is near Edmonton, Alberta. The origin of C. n.sp. is at present unknown and its host Scots Pine is not native to B.C. The other 3 species feed on lodgepole pine throughout B.C. Tom discussed the species found in central B.C. near Prince George; preliminary pheromone studies indicate it is a new species, designated: C.PG. Another pine feeder, C.HL, found on Vancouver Island (Horne Lake), appears close to C. n.sp. in overall morphology but feeds on lodgepole pine. Its relative isolation from other pine feeders and one month later flight than C. PG suggest that it is also a new species. The other pine-feeder, C. lambertiana, is found in southeastern B.C. and southwestern Alberta. It is easily distinguished from other Choristoneura in B.C. by its yellowish-orange forewings. We have now identified the main

groups or species of Choristoneura in the region; their distributions are roughly known and will be fine-tuned in the near future.

Gary Daterman (Forest Service,PNW,Corvallis) discussed the status of pheromone chemistry and related behaviour of six western US species and subspecies of Choristoneura. Those covered included the Douglas fir-feeding C. occidentalis, C. carnana carnana, and C. carnana californica, the white fir-feeding C. retiniana, and the pine-feeding C.lambertiana lambertiana and C. lambertiana ponderosana. Past and recent work show conclusively that both carnana and californica are strongly attracted to the known occidentalis pheromone, a 92:8 mixture of E:Z-11-tetradecenal. The corresponding alcohols and acetates are also present in female pheromone emissions; these materials may optimize male response but field tests with synthetic lure preparations have not substantiated this view. The remaining three Choristoneura taxa all respond to acetates with the retiniana pheromone established as a 92:8 blend of E:Z-11-tetradecenyl acetates plus a 10 percent complement of the corresponding alcohols to enhance the attraction. The pine-feeders, subretiniana and ponderosana, respond to 60:40 and 70:30 mixtures of E:Z-11-tetradecenyl acetates, respectively. In spite of pheromone differences among Choristoneura taxa, field trapping shows a degree of interspecific attractions occurs. A recent collection of subretiniana from ponderosana pine in central Oregon yielded females containing 10-percent aldehyde in their pheromone, suggesting hybridization with occidentalis had occurred. It was concluded that synthetic lures can be used to selectively trap sympatric species, but that a degree of cross-attraction and natural hybridization occurs, particularly where occidentalis is present in high density populations.

Chris Sanders (Forestry Canada,Ontario Region,Sault Ste. Marie) reported that known blends of pheromones of C. fumiferana and C.pinus are inferior to the natural female-emitted pheromone. He concludes that additional pheromone components remain unidentified. In cooperation with RPC, Fredericton a number of possible additional pheromone components have been identified and tested over the past few years. No compounds tested have raised the levels of response by males to that of a calling female moth. Cooperative studies of C. pinus pheromone have been initiated with K. Slessor (UBC). Chris stresses the importance of using female moths in trapping studies.

George Harvey (Forestry Canada,Ontario Region,Sault Ste. Marie) has applied isozyme techniques to problems of identification and taxonomy in the northwest. The unique isozymes of Aspartate Transaminase in C.fumiferana compared to all other conifer-feeding members of this group have been used to map the distribution of fumiferana in the northwest. Male moths caught in sticky traps were frozen in liquid nitrogen and returned to the laboratory for isozyme determination. The results confirm the presence of C. fumiferana in Yukon and Alaska and show it to be sympatric with C. orae in parts of this area. It is also present in northeastern B.C. and has been found to be sympatric with C.biennis in a limited part of the Pine Pass area. No evidence of any intermediate forms was found. Genetic information for this and other loci are being used to interpret relationships among these and other conifer-feeding Choristoneura. Collected males and genitalia from all samples have been sent to P.T.Dang and Roy Shepherd for further study.

P.T.Dang (Agriculture Canada, BSC, Ottawa) has measured number of spicules and length of the apical spine on aedeagi from Choristoneura species from populations from across Canada. The means of these measurements and counts indicate that C. fumiferana and its close relative C. pinus which have the shortest apical spine and highest spicule counts are markedly different from other conifer-feeding species in North America. These differences were illustrated with several SEM slides. Specimens collected in pheromone traps in northern Alberta, B.C. & in southern Yukon and Alaska show a sharp decrease in the number of spicules and a significant increase in the length of the apical spine. This suggests the presence of a potentially intermediate condition between C. fumiferana and western species including C.orae and C.biennis in these regions.

Marion Page (Forest Service,PSW,Berkeley) The thin layer of wax on the surface of all terrestrial arthropods prevents dessication, acts as a barrier to abrasion, micro-organisms and chemicals and may function in communication. The major lipids in this wax are hydrocarbons, synthesized by the insect; they are genetically controlled stable end-products. Page and Michael Haverty (Berkeley) have used cuticular hydrocarbons as chemotaxonomic characters for termites, bark beetles, cone beetles, seed buds and cone moths. Hydrocarbon characteristics corroborate morphological characters and can substantiate species status even where morphological characters have not been found.

Recently Page and Haverty identified the cuticular hydrocarbons of Choristoneura fumiferana and C. occidentalis adults from the U.S. and Canada. Unlike most other forest insects their hydrocarbon mixtures were very simple. They consist of a continuous series of normal alkanes from C23 to C29. The hydrocarbon mixtures are qualitatively identical. Quantitative differences, however, appear to be consistent and can be used for species separation. If other species in the genus contain qualitatively similar components, canonical discriminant analysis will be used to determine species differences.

Informal discussion followed these presentations. Research needs identified in 1985 were reviewed. Up-to-date information on status and distribution of all entities was reviewed. Information presented at Bend indicates significant progress toward answering some of the questions identified in 1985 but also revealed the absence of real progress in some areas. Continuing needs were identified and some new problems clarified. The area of greatest need continues to be the Pine-feeding species in the Pacific Northwest. There is interest in a follow-up workshop in 1993! A more complete report has been sent to current and former participants.

WORKSHOP: TOPKILL CAUSED BY INSECTS AND DISEASES
Moderators: Brian Geils and Rene Alfaro

About 15 people attended this discussion on the causes of topkill, its effects on the host, and methods for quantifying the extent of damage. Rene Alfaro introduced the subject and briefly described his work on the spruce weevil which affects the terminal leader and causes form defects, and spruce budworm which destroys terminal buds and needles and causes topkill. Brian Geils illustrated two disease agents, dwarf mistletoe and stem rust, both of which cause topkill and progressive dieback of the crown. Our first exercise in the discussion was to list some agents responsible for topkill of western trees and to identify their activity as progressive (P) if damage severity increases with time since attack or infection, as incidental (I) if one-time damage occurs as result of an injury, and as repetitive (R) if distinct injury events tend to recur on the same tree.

Causes of topkill

Type	Example	Activity
terminal feeding insects	western pine shoot borer	IR
defoliating insects	western spruce budworm	IR
twig and bark beetles	Ips	I
canker fungi	Fusarium pitch canker	P
stem and limb rust fungi	white pine blister rust	P
gall rust fungi	western gall rust	I
needle cast fungi	Rhabdocline needle cast	IR
dwarf mistletoe	Lodgepole pine dwarf mistletoe	P
blights, diebacks, root disease	Armillaria root disease	P
mammals	porcupine	IR
lightning		I
storm breakage	wind, snow, ice	I(R)
chemical damage	air pollution	I(R)
winter kill	freezing of buds and shoots	I
tall tree winter kill	breakage of water column	I
genetic or unknown defects	terminal broom of black spruce	?

The death of the upper portion of a tree has numerous effects on height growth, radial growth, survival, reproductive capability, competitive status, predisposition to other agents, timber value, suitability for wildlife, aesthetic value, and hazard to safety. Topkill may not always be perceived as as a loss, for example a topkilled tree that contains an eagle nest may be highly prized.

How the extent or severity of topkill should be measured depends on the objective and time frame of the evaluation. Some of the commonly measured elements are height to base of damaged stem (truncation), departure from standard taper, recovery pattern (crooks, forks), extent of decay, amount of foliage lost, sapwood basal area, response of neighboring undamaged trees, and number and distribution of damaged trees. Damage can be detected on routine ground surveys or by remote sensing. Careful use of a band saw can reveal internal details and expose annual rings for stem analysis.

WORKSHOP: SEMIOCHEMICALS OF BARK BEETLES: RESULTS FROM RECENT FIELD TESTS

Moderator: Gary Daterman

Participants: Skeeter Werner, Pat Shea, Mark McGregor, Art Stock, Ralph Thier, Ron Billings, Gene Amman, Hal Wieser.

Skeeter Werner began the session with a glowing report of new spruce beetle aggregation components, and their successful enhancement of synthetic lure attraction. Verbenone and a methylcyclohexenol isomer added to frontalin and alpha-pinene yielded the best attraction among lures tested. This cooperative study (USFS, CFS, U. of Calgary) will continue in 1990 to further optimize the lure. Pat Shea reported on cooperative (PSW, PNW, Phero Tech) aerial application tests of controlled-release formulations of verbenone against mountain pine beetle in Montana. The 1988 testing was successful in reducing numbers of new attacks in 20-acre treated plots, whereas 1989 tests are inconclusive, pending final plot evaluations. Further field testing is planned for 1990. Gene Amman reported on the efficacy of verbenone bubblecap releasers for mountain pine beetle. The results indicate the manually-applied bubblecaps were effective for protecting individual trees, and also reduced numbers of new attacks in stands where bubblecaps were applied in grids. Treatments of 20, 40, and 68 bubblecaps/acre were tested, with the 40-cap treatment appearing most effective.

Art Stock (Simon Fraser Univ.) discussed Ips pini and balsam fir beetle, Dryocoetes confusus, pheromones with a mention that further improvements of the spruce beetle aggregation pheromone are on the way. He mentioned verbenone and ipsenol as anti-aggregants for Ips pini, and discussed the necessary spacings for baiting a stand to ensure attack by the balsam fir beetle. Endo-brevicomin is an effective anti-aggregant for balsam fir beetle, whereas exo-brevicomin functions as an aggregation pheromone.

Mark McGregor briefed the group on a test in Idaho to evaluate verbenone enantiomer blends for anti-aggregation efficacy against western pine beetle. The test was inconclusive, but the -97% enantiomer treatment appeared as good or better than any other treatment for preventing attraction to baited traps. Although his analysis was unfinished, Ralph Thier reported that 2-5 synthetic lures apparently resulted in no differences for securing spot infestations of Douglas-fir beetle in Idaho for salvage-removal treatments. Spray and bait treatments of ponderosa pine with Phero Tech lures and carbaryl for western pine beetle are installed and will be evaluated next year.

Ron Billings reported on a sprayable polymer formulation of verbenone tested on southern pine beetle in Texas. Treatments of 8 mg (A.I.) per tree were promising for halting infestation growth, particularly when applied after felling freshly-attacked trees. Work is continuing using polybags containing verbenone-treated sponges.

Hal Wieser and his collaborators (U. of Calgary) have been involved in various bark beetle pheromone identification studies, and in 1989 implemented an evaluation of traps to monitor spruce beetle populations. Traps were placed in areas of light and heavy beetle populations, with some traps located outside stands in open locations. No beetles were caught in the open areas, whereas trapping was successful in low population density areas without causing "spillover"

attacks in surrounding trees. Spillover did occur in the high-density beetle locations. Douglas-fir beetles were invariably captured in large numbers alongside spruce beetles, even though the nearest Douglas-fir stands were between 50 to 100 km from the monitoring sites.

There was considerable participation and interest in this workshop accompanied by some degree of frustration related to the number of issues and limited time for discussion. There was a strong degree of interest expressed for continuing the workshop at the March 1990 meeting.

PANEL: BARK BEETLE-PATHOGEN INTERACTIONS IN CONIFEROUS FORESTS

Moderators: Tim Schowalter and Greg Filip

Participants: Peter Lorio, Everett Hansen, Terry Shaw

Schowalter outlined the scope of the U.S.D.A. W-110 project "Interactions among bark beetles, pathogens and conifers in North American forests" and noted that this project represents an example of accomplishments possible through cooperation of entomologists and pathologists. Three areas covered in a forthcoming synthesis volume were chosen for this panel because of their contribution to understanding and managing bark beetle-pathogen complexes.

Lorio discussed the role of tree physiological processes in determining susceptibility to bark beetles and pathogens. Tree physiological processes have been largely ignored in the past and remain poorly understood. Recent recognition of the central role played by tree physiology in resistance to pests has stimulated fundamental research.

Physiological processes are under genetic control but are modified by environmental conditions. The oleoresin system of conifers constitutes a primary defense against entry by insects and pathogens. However, oleoresin flow rate and duration of flow vary with tree condition. Healthy trees producing photosynthates sufficients for vegetative and reproductive growth, as well as production of various metabolites (including defensive compounds), are more resistant to invasion than are unhealthy trees. Resistance often is higher in late summer than in early spring due to the production of resin ducts during late wood formation. Bark beetle activity peaks during early wood formation when resin ducts are blocked. Reproduction demands can strain the ability of a tree to maintain other physiological processes, including resin production. Aging leads to reduced metabolic rate, slower wound healing, and reduced resistance to insects and pathogens.

Enviromental conditions also influence tree resistance. Stressful conditions can inhibit allocation of critical resources to defenses. Severe water deficits, for example, reduce oleoresin flow, and also reduce needle production, with long-lasting effects on photosynthate supply. However, stress does not necessarily promote pests. Moderate water deficits during the spring growth flush can reduce the allocation of available energy to new growth, thereby increasing allocation to oleoresin synthesis. Severe droughts often are associated with high temperatures during late summer which are unfavorable for bark beetle.

Advances in our understanding of tree physiology are fundamental to managing resistance to pests. Thinning of closely-spaced trees has become an accepted means of improving physiological condition of the remaining trees, although potential pest problems associated with disturbance must be considered. The reliability of predictive models depends to a large extent on improved understanding and integration of host physiology into these models.

Impacts of bark beetle-pathogen interactions are diverse, depending on forest uses, and often are not obvious. Hansen noted that "impact" is an abused word which can be defined approximately as "the effect of an organism on some process or value." Critical points include 1) the need to emphasize the plural "impacts," 2) useage with respect to particular resources or values, 3) value judgements are not required an may be inappropriate.

The context may be a physiological process, such as the impact of a root rot on water conduction or cambial function. More often, we are concerned with pest impact on forest management objectives, such as wildlife habitat or timber yield. The importance of carefully defining the context is illustrated by an example in which a silvicultural goal was enhancement of insect and pathogen activity in order to create old-growth characteristics in young stands.

Bark beetle and root pathogens both have dramatic, lethal effects on tree physiology although they operate at different rates. An example is the Phellinus weirii - Dendroctonus pseudotsugae association. The fungus affects bark beetle by providing a constant supply of weakened and killed trees suitable for beetle development. Together, these organisms cause the greatest economic impact of any pest on Douglas-fir timber productivity. The actual dollar loss depends on salvage frequency, disease incidence, and market conditions, but about 5% of the forest area is affected.

This pathogen-bark beetle association increases biological diversity in affected stands. Mortality centers have higher light intensity and consequently develop a more complex flora than surrounding unaffected areas. Animal diversity also increases in response to food and habitat resources represented in diverse vegetation and dead trees.

Forest succession is accelerated by the Phellinus-Dendroctonus association. In most areas, Douglas-fir is the susceptible seral species. The more shade-tolerant later-successional cedar and hemlock are tolerant or resistant to attacks by these two organisms. The rate of transition apparently varies with stand age. Mortality is much lower in old-growth stands than in 50-150 year old stands.

Impacts on scenic and other recreational values are difficult to assess. Mortality at high elevations may often enhance the outdoor experience by contributing the gnarled, dead trees associated with wild areas. Education likely is a key to promoting understanding and appreciation of various impacts of pathogen-bark beetle interactions among visitors to forests.

Prediction of impacts and assessment of suppression options are the purposes of modeling efforts. Models are useful for synthesizing information, predicting future trends, and focusing research on high priority data requirements. However, models are limited to available information and usually are based on numerous assumptions where data are lacking.

Shaw outlined the development of the western root disease model and discussed model outputs and assumptions. Complex interactions among various root disease and bark beetles have required simplification for modeling purposes. Therefore, an aspect of this model is its representation of functional, rather than taxonomic, distinctions. For example, bark beetles are classified as aggressive (capable of killing trees independently of root diseases) vs.

non-aggressive (restricted to diseased or severely-stressed trees). Model predictions for particular taxa can be accomplished by selecting the appropriate functional groups.

This model currently is being tested and evaluated. Any discrepancies between observed and modelled trends will be used to refine the model. This process of testing and refinement should lead to improved ability to predict and manage effects of bark beetle-pathogen complexes.

Filip concluded the panel by noting that the efforts of the entomologists and pathologists working on bark beetles and root pathogens will be recognized in a book scheduled for publication by Academic Press. The multidisciplinary approach to study of bark beetle-pathogen-conifer interactions can serve as a model for studying interactions in other ecosystems.

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APPENDICES

North Carolina State University
School of Agriculture and Life Sciences

Department of Entomology
Box 7626
Raleigh, NC 27695-7626

919-737-3804

May 31, 1989

MEMORANDUM

TO: Ad Hoc National Committee of Forest Health Issues (Fields Cobb, Joseph Elkington, Doug Honnold, Bill Jacobi, John Laut, Jesse Logan, Ann Lynch, Bill MacDonald, Max McFadden, Tom Payne, Bill Ravlin, Terry Shaw, David Wood

FROM: Fred Hain

SUBJECT: Constitution and Bylaws of the National Council of Forest Health Issues (NCFHI)

Enclosed is the first draft of our constitution and bylaws. Please look it over and give me your comments in about two or three weeks. I borrowed liberally from the position statement of the A.P.S. I have asked some specific questions of the draft itself.

gh
d/60

North Carolina State University is a Land-Grant University and a constituent institution of The University of North Carolina.

committee? I like "council" better.

National Council on Forest Health Issues
Constitution and Bylaws (Draft)

The health of forests, on a world-wide basis, is essential to the maintenance of a quality environment for sustaining all living species. Healthy forests are critical to such issues as global climate change, loss of biological diversity, and sustainability of natural resources. Yet, at a time when many experts are saying that the decade of the 1990's has to be a turning point in human endeavors to protect our planet's ecosystem, the forestry profession finds itself ill-prepared to meet the challenge. For more than a decade support for research and education in forestry and natural resources has eroded. This has been especially true in most areas of forest biology such as ecology, silviculture, pathology and entomology. The decline in areas of resource protection has reached a dangerous level, particularly when the demands on the forest and the impacts of human activities - from timber harvesting to air pollution and the greenhouse effect - are increasing so rapidly.

The long-term maintenance of healthy forests requires strong support in 3 areas: (1) the application of sound biological and ecological principles in the management of forest resources; (2) education and training of entry level professionals to apply biological and ecological principles for forest management and protection; and (3) staffing and support for research in forest health.

During the past several decades, application of biological/ecological principles has dramatically declined as emphasis on maximizing yield has increased. Consequently, academicians in charge of educating the future forest managers have often reduced the biological/ecological requirements below a reasonable minimum. Thus, a new generation of professionals is sent forth with even less understanding of the forest as an ecological system, and the application of biological/ecological principles is reduced even further.

Because the evidence is overwhelming that to ignore biology/ecology is to place the health of our forests in great peril, the National Council on Forest Health Issues (NCFHI) was created to provide a forum of concerned professional foresters to disucss and take action, in concert with affiliated professional forestry organizations, on issues of forest health.

Voting members of the NCFHI are representatives of various professional forestry organizations, such as the Forest Pest Control Action Councils, Forest Insect and Disease Work Conferences, Insect and Disease Committees of the Society of American Foresters (SAF), and the Executive Committee of the SAF, that are concerned with forest health issues.

Organizations may become affiliated with the NCFHI by requesting memberships from the chair of the NCFHI. The chair may also invite certain organizations to become members. The meetings of the NCFHI are open, and non-voting members are also encouraged to attend. Each affiliate will be represented by (2) NCFHI members (including officers). The officers of the NCFHI are the chairperson, vice chairperson, and secretary. Their term of office is (3) years, they are elected by the voting members of the NCFHI, and they may be re-elected. How the voting members or their substitutes are selected by the affiliated organizations is determined by the affiliate. However, the NCFHI encourages the affiliates to send representatives for a 3 year term as well. There will be no proxy votes.

The responsibilities of the chairperson of the NCFHI are to call a meeting at least once a year, to set the agenda and distribute it to the members at least two weeks before the meeting, and to moderate the meeting. The vice chair will perform the functions of the chair in the absence of the chair, and will assume full responsibility of the chair in the event the regular chair is unable

to fulfill those responsibilities. The secretary will be responsible for taking complete and accurate minutes of the NCFHI meetings, and for distributing the minutes to the members. Each member will be responsible for reporting back to the affiliate all activities of the NCFHI.

The NCFHI will take action on all resolutions that receive a two-thirds majority vote of the members present, and encourage the affiliates to take similar action. Fifty percent of the members must be present to obtain a quorum. The NCFHI will operate indepehdently of its affiliates, and will not claim to represent the affiliates in any of its actions.

The types of activities the NCFHI will be interested in include, but not be exclusive to: (1) education, including a possible national forum; (2) SAF interactions, including accreditation; (3) increased cooperation among universities, the U.S. Forest Service and other governmental agencies; (4) interactions with industry; (5) interactions with silviculturalists and managers; (6) interactions with the FIPR 10-yr Plan and with Strategic Planning; (7) policies involving facilities, grants and competitive grants; (8) questions about addressing biotechnology; and (9) utilizing tools for technology transfer, synthesis and implementation.

WFIWC AWARDS COMMITTEE QUESTIONNAIRE

	Yes	No
I. Do you favor a WFIWC-sponsored award? If "Yes", which of the following:	☐	☐
A. One annual award for outstanding contributions to the profession of forest entomology	☐	☐
B. Annual awards in two or more of the following categories:		
1. Administration	☐	☐
2. Teaching	☐	☐
3. Research	☐	☐
4. Pest management activities	☐	☐
5. Service--contributions to WFIWC, science, forestry	☐	☐
6. Other(s) (list) _____ _____ _____		
C. Other award categories (be specific): _____ _____ _____ _____		

NATURE OF AWARD

II. What type of an award do you favor:		
A. Plaque with appropriate inscription	☐	☐
B. Recipient--designated as "Presentor of Keynote Address" at succeeding WFIWC	☐	☐
C. Other: _____ _____ _____ _____		
Would you favor naming the award after:		
A. A distinguished member of the Conference	☐	☐
B. Forest Entomologist at large	☐	☐
B. Neither Suggested Name: _____	☐	☐

CRITERIA AND COMMITTEE COMPOSITION

Are the selection criteria and award committee composition used by SFIWC acceptable?

Yes ☐ No ☐

If "No," how would you alter criteria or committee composition?

_____

_____

Other General Comments:

Guidelines for the A. D. Hopkins Award: Southern Forest Insect Work Conference

The A. D. Hopkins Award is sponsored by the SFIWC and presented to an individual with an outstanding record of service to Southern forest entomology. The award is presented only in years when 5 of the 7 Award Committee members are in concurrence. Distinguished administration, research, teaching, and technology transfer activities or any combination of these may be involved. The principal criteria for choosing the recipient will be service to southern forest entomology which includes any or all of the following:

a. Quality of teaching at undergraduate and/or graduate levels.
b. Effectiveness of extension and technology transfer activities.
c. Significance and originality of research and/or administrative contributions.
d. Contributions to science or other fields, nationally or internationally.

Eligibility of Nominators

Nominations for the A. D. Hopkins Award will be accepted from any individual, except members of the SFIWC Executive Committee or the Award Committee.

Eligibility of Nominees

The nominee should have an outstanding record of service to Southern forest entomology. Members of the SFIWC Award Committee are not eligible for nomination. Any person having received the Award within the past five years is also not eligible.

3. Administrative contributions

   a. Obtaining financial support.

   b. Administration of teams making significant contributions.

   c. Contributions to policy which affect southern forest entomology.

4. Teaching contributions

   a. List courses taught, and when they are offered.

   b. An evaluation of teaching effectiveness and teaching contributions (summaries of student and/or administrative evaluations).

   c. Graduate students trained, names, and degree received.

   d. Current graduate students.

5. Grants in research, teaching or extension. Title only.

6. Honors and awards.

7. Contributions to professional organizations.

Evaluation: Identify in this section the primary contributions on which the nomination is based. Explain why the nominee is especially well qualified to receive the award. Consideration of the criteria used by the committee evaluating the nomination should be helpful in developing an effective evaluation statement.

Supporting Letters: Supporting letters should be included, but no more than 3 supporting letters will be accepted. No single letter should exceed one single-spaced page. The letters should be solicited by, and addressed to, the nominator.

Nomination Procedures

Preparation: Preparation of the best nomination possible for a distinguished colleague is a compliment to both the nominee and the nominator, and it provides the maximum possibility that the nominee will be selected to receive the award. Obtaining the assistance of the nominee in supplying information is encouraged and should improve the accuracy and completeness of the documentation. Clearly identifying and evaluating the nominee's contributions are the most important part of the nomination because the nominees will be ranked primarily on this basis. Nominators should include a brief statement indicating major areas of activity represented in the nominee's position and the percent of time spent for each (i.e. research, teaching, extension and/or administration). The weighting placed on the criteria mentioned on page 1 will be based on this information.

Format: Organize the nomination in the order shown in the above format. Type the nomination single-spaced on 8 1/2 x 11" paper. The nomination shall not exceed 4 pages (excluding the supporting letters).

Submission: Assemble seven complete copies of the nomination, and staple each copy in the upper left corner. Do NOT place the documents in any type of folder. Each copy must contain: (1) the nomination proper, and (2) one copy of no more than 3 supporting letters. No letter should exceed 1 single-spaced page. Thus the total documentation shall not exceed 7 single-spaced pages (4 for the nomination, 1-3 for supporting letters). Mail seven (7) copies to: Dr. C. Wayne Berisford, Department of Entomology, University of Georgia, Athens, GA 30602.

Deadline Date: The deadline for receipt of nominations is July 10, 1987.

Persons serving on the Award Committee are not eligible to be nominated for an award, prepare a nomination, or write a letter of support. The following is a list of persons serving on the A. D. Hopkins Award Committee for 1987.

C. Wayne Berisford, Chairman

J. Robert Bridges

Robert N. Coulson

John F. Godbee, Jr.

Forrest L. Oliveria

Terry S. Price

John W. Taylor, Jr.

Format For A. D. Hopkins Award Nominations

Title: Entitle the document, "Nomination of _____ for the A. D. Hopkins Award."

Nominee: Include the nominee's name, mailing address, and telephone number.

Documentation of Nominee:

1. Professional positions held. Give years, organization, locations and principal duties for each position.

Qualifications of Nominee:

1. Service and extension contributions
   a. Training sessions.
   b. Development of training aids.
   c. Technical assistance.
   d. Technology implementation.
2. Professional publications and invitational presentations. List literature citations for all or the most important publications. Do NOT send reprints.
   a. Non-technical papers.
      This may include books, pamphlets, bulletins, or magazine and newspaper articles.
   b. Technical papers
   c. Book chapters
   d. Books written
   e. Books edited
   f. Other publications edited
   g. Invited lectures, seminars and symposia presentation.
   h. Papers offered and presented at professional societies or trade organizations.

Any nomination failing to meet the general requirements stated above or the specific format stated below will be declared ineligible by the Chairman of the Award Committee and returned.

United States Department of Agriculture | Forest Service | Region 1 | Federal Building, P.O. Box 7669, Missoula, MT 59807

Reply to: 3400

Date: September 12, 1989

Dear Colleague:

Though the joint WIFDWC/WFIWC meeting is barely underway, it is less than six months until the 41st Annual WFIWC will convene in Coeur d'Alene, Idaho. For that reason, we are soliciting your help on fairly short notice. Attached you will find a preliminary program agenda. We would appreciate your comments and opinions regarding same, as soon as is reasonably practical. At the same time, we are asking for volunteers (either first or third person!) for workshops, panels, etc.

We would like to receive your responses by October 15. While that isn't a lot of time, we need to allow sufficient time for preparation once assignments have been made or accepted. Don't hesitate to make suggestions--our work conferences can be successful only to the extent they meet the needs and expectations of our membership.

Thanks for your help. We look forward to seeing you in Coeur d'Alene in March.

Ken Gibson
Program Co-Chairman
TCFPM, Missoula, MT

Sandy Gast
Program Co-Chairman
TCFPM, Missoula, MT

Sara Zimmer Grove
Program Co-Chairman
TCFPM, Missoula, MT

41st ANNUAL WESTERN FOREST INSECT WORK CONFERENCE

"The Coeur d'Alene"
COEUR D'ALENE, IDAHO
MARCH 6-8,1990

THEME: Forest Entomology in the West: Past, Present and Future

Panel Discussions:

I. History and Future Role of Forest Entomology

II. Gypsy Moth in the West

III. Status of On-going Forest Insect Research

Workshop/Discussion Groups:

* Insect pheromones as they relate to pest management
* Silvicultural control of major pests (MPB, SBW, etc.)
* Pest impacts on tree improvement efforts
* Status and future of biotechnology
* Role of parasites and predators in pest management
* Use of defoliators to aid in vegetation management
* Forest insect bionomics: Scolytids, balsam woolly adelgid, shoot borers, weevils (terminal and root collar)
* New technologies in aerial application of pesticides
* Status of pest models
* Role of GIS in pest management

These are just a few proposed topics. We solicit your suggestions for others. Likewise, we welcome "volunteers" willing to lead workshop discussions.

We also welcome comments on "extra curricular" activities. Some suggested ones are:

"After hours" discussion groups
Wallyball/racquetball tournament
Fun Run (5 or 10 K)
Bowling, skiing, etc.
"Hands on" computer sessions: Pest models, spray deposit models, pathlink, etc.
Poster sessions

Amendments to the Constitution of Western Forest Insect Work Conference

Purpose: To separate the office of Secretary-Treasurer into two (2) offices: Secretary and Treasurer, as follows:

Article IV - Officers and Duties

(3) A secretary to act for a period of two (2) meetings, whose duties shall be to keep a record of Executive Actions, record minutes of Executive Committee and conference business meetings, to maintain committee correspondence, and to send out notices, reports and proceedings. The Secretary is charged with the responsibilities of coordinating preparation of the proceedings. (Amended Feb. 28, 1967, Las Vegas, NV; and Sept. 15, 1989, Bend, OR).

(4) A Treasurer, who is a non-voting member of the Executive Committee, to act for an indefinite term, whose duties shall be to keep a record of funds collected and disbursed, to issue monies for approved purposes, to maintain a record of members, committees, and officers, and to provide mailing lists and/or labels as needed. The Treasurer will provide financial records for inspection by a two-member Executive audit team, comprised of the Chairman and Immediate Past Chairman annually prior to the Executive Committee meeting (Amended Sept. 15, 1989, Bend, OR).

(5) An Executive Committee of six (6) members, consisting of Chairperson, Immediate Past Chairperson, Secretary, and three Counsellors elected from the membership. Terms of office for the three Counsellors shall be staggered and for a period of three meetings each. The duties of this Committee shall be to carry out actions authorized by the Conference; to authorize expenditures of funds, and to establish policies and procedures for the purpose of carrying out the functions of the organization. The Conference registration fee will be set by the local Arrangements Committee in consultation with the Secretary, Treasurer and Chairman (Amended March 4, 1965, Denver, CO and Sept. 15, 1989, Bend, OR).

CONSTITUTION
OF
WESTERN FOREST INSECT WORK CONFERENCE

Article I Name

The name of this organization shall be the Western Forest Insect Work Conference.

Article II Objects

The objects of this organization are (1) to advance the science and practice of forest entomology, (2) to provide a medium of exchange of profession thought, and (3) to serve as a clearing house for technical information on forest insect problems of the western United States and Canada.

Article III Membership

Membership in this organization shall consist of forest entomologist and other interested in the field of professional forest entomology. Official members shall be those who pay registration fees.

Article IV Officers and Duties

The Officers of this organization shall be.

(1)A Chairman to act for a period of two meetings, whose duties shall be to call and preside at meetings and to provide leadership in carrying out other functions of this organization.

(2)An immediate Past Chairman, who shall assume office immediately upon retiring as Chairman without further election; whose duties shall be to fill the chair at any meeting in the absence of the Chairman; to act until the election of a new Chairman.

(3)A Secretary to act for a period of two meetings whose duties shall be to keep a record of Executive Actions, record minutes of Executive Committee and conference business meetings, to maintain committee correspondence, and to send out notices, reports and proceedings. The Secretary is charged with the responsibilities of coordinating preparation of the proceedings. (Amended Feb. 28, 1967, Las Vegas, Nevada; and Sept. 15, 1989, Bend, OR).

(4)A Treasurer, who is a non-voting member of the Executive Committee, to act for an indefinite term, whose duties shall be to keep a record of funds collected and disbursed, to issue monies for approved purposes, to maintain a record of members, committees, and officers, and to provide mailing lists and/or labels as needed. The Treasurer will provide financial records for inspection by a two-member Executive audit team, comprised of the Chairman and Immediate Past Chairman annually prior to the Executive Committee meeting (Amended Sept. 15, 1989, Bend, OR).

(5)An Executive Committee of six members consisting of Chairman, Immediate Past Chairman, Secretary-Treasurer, and three Counsellors elected from the membership. Terms of office for the three Counsellors shall be staggered and for a period of three meetings each. The duties of the Committee shall be to carry out actions authorized by the Conference; to authorize expenditures of funds, and to establish policies and procedures for the purpose of carrying out the functions of the organization. The Conference registration fee will be set by the local Arrangements Committee in consultation with the Secretary, Treasurer and Chairman (amended March 4, 1965, Denver, Colorado and Sept. 15, 1989, Bend, OR).

The officers shall be elected at the Annual Meeting. Their periods of office shall begin at the conclusion of the meeting of their election.

The Chairman shall have the power to appoint members to fill vacancies on the Executive Committee occurring between meetings. The appointment to stand until the conclusion of the next general meeting.

It is the responsibility of a Counsellor, should he be unable to attend and executive meeting, to appoint an alternate to attend the executive meeting and to advise the Chairman in writing accordingly. The alternate shall have full voting privileges at the meeting to which he is designated.

Article V Meetings

The objectives of this organization may be reached by holding of at least an annual conference and such other meetings as the Chairman, with the consent of the Executive Committee, may call. The place and date of the annual shall be determined by the Executive Committee after considering any action or recommendation of the conference as a whole. The Secretary-General shall advise members of the date and place of meetings at least three months in advance.

Article VI Proceedings

A record of proceedings of conference shall be maintained and copies provided to members in such form as may be decided as appropriate and feasible by the Executive Committee.

Article VII Amendments

Amendments to the Constitution may be made by a two-thirds vote of the total conference membership attending any annual meeting.

Prepared by Richard Washburn
March 20, 1969.

FUN RUN

Wednesday, September 15, 1989

The inaugural Ento's vs Patho's 5K fun run attracted 35 participants. The pathologist took trophies in both the male and female categories with Jim Entry running an 18:20 and Kathy Lewis with a time of 20:05. This means the Patho's hold the title until the two groups meet again and a re-match can be organized! Many thanks to Dave Holland who supplied the trophies and organized the run.

NORTH AMERICAN FORESTRY COMMISSION

ORIGIN

The North American Forestry Commission was established by Resolution 27/59 of the Tenth Session (1959) of the FAO Conference, upon the desire of the Governments of Canada, Mexico, and the United States of America.

The Commission is one of six regional Commissions. Other Commissions are the Asia-Pacific, the African, the Latin American, the Near-East, and the European Forestry Commission.

OBJECTIVES

1. To promote cooperation and facilitate the exchange of information among members of the Commission on forestry matters of mutual interest.

2. To provide the Assistant Director General of FAO's Forestry Department with information on forestry matters within the North American region and provide advice and guidance on FAO's forestry program.

MEMBERSHIP

Canada, Mexico, and the United States of America constitute the members of the Commission.

PROCEDURES

The Commission held its First Session in Mexico in 1961 and meets every two years. English and Spanish have been designated as the official languages of the Commission. Sessions alternate between the three member countries. FAO provides the secretariat for the Sessions.

PROGRAM OF WORK

Contact and collaboration among the three member countries is achieved through technical subsidiary bodies or study groups. These groups cover specific areas of common interest and bring together subject matter specialists to resolve specific problems. The work program varies depending on the subject matter and may include workshops, seminars, joint projects, study tours, and special assignments. Where applicable, cooperation is sought with other regional commissions and their subsidiary bodies to execute the work program.

THE STUDY GROUPS

Forest Tree Improvement - This study group is mainly concerned with forest genetics and tree improvement, including urban and environmental. Since its inception in 1965, the study group has carried out 25 tasks including:

The development of a series of recommendations and position papers that were presented to the Government of Mexico to promote tree improvement within INIF.

Providing the mechanism for training in the United States of a number of Canadian, Mexican, and U.S. foresters in genetics.

Jointly preparing a series of state-of-the-art technical reports on subjects directly related to issues of individual governments. These included energy plantations, urban forestry breeding, and germplasm exchanges.

Assisting in the development of cone and seed insect manuals.

Promoting the establishment of a seed center in Mexico.

Providing a mechanism for contacting and working with the LAFC. Conducted two joint meetings.

Currently preparing a glossary of tree improvement terms in five languages.

Insects and Diseases - This study group prepared and published the 122 page document Cone & Seed Insects of North American Conifers in 1980, and is soon to combine a supplement of new information with the third printing of the major publication. The group is preparing a companion document Cone & Seed Diseases of North American Conifers to be published in 1986.

A third project, due for completion in 1986, is the preparation of a catalog of the Scolytidae of the world.

Other projects of current concern are (1) quarantine requirements and procedures to prevent introduction and spread of exotic pests and (2) development of strategies to prevent reestablishment of the European Larch Canker in North America.

Forest Engineering - The principal areas of concern addressed by this group are:

Timber harvesting from small forest land ownership.

Organization of small ownership to improve productivity.

The use of wood for energy.

Improved naval stores operations.

Recent efforts have focused on technology transfer to reduce physical energy requirements and improve productivity in forestry operations. A handbook

entitled Basic Technology in Forestry Operations was published by FAO in 1982. This handbook summarizes and describes the use of many labor-saving devices that were invented in several different countries.

Plans call for field location seminars on species selection, production, harvesting, and converting short-rotation forest species; developing a directory of expertise and organizations studying harvesting technologies; developing improved methods of information exchange, particularly in biomass energy; and continuing "organization of forest owners" as a subject matter of the study group.

Fire Management - This study group was organized in 1962 to address jointly the forest fire problems of the three countries. Accomplishments include:

Continued publication of the periodical Forest Fire News, a technology transfer magazine distributed throughout North America and in limited copies to the rest of the free world.

The staging of three international fire study tours, the most recent one a prescribed fire study tour of the southeast United States and southern California for foresters from nine countries.

Promotion of mutual fire assistance agreements between the United States and Canada, and the United States and Mexico, for fire-fighting assistance along the frontiers.

Development of a family of international fire prevention signs and sponsorship of several international fire prevention poster contests among the member countries.

Arrangement of four fire management personnel exchanges among the member countries to facilitate technology transfer and share fire management expertise.

Annual exchange of fire management personnel directories among the three countries.

Sponsorship of fire training course translations for cross-use of course materials among the countries.

Sponsorship of participation in fire training courses on an international basis, and sharing (loaning) instructors between countries. (In 1983, ten Mexican fire specialists attended a special U.S. course conducted in Spanish. In 1984 this course will have a Mexican instructor on the faculty.)

Other working groups of the NAFC include Silviculture, Wildlife, and Remote Sensing. A new group is being formed in 1984, this one dedicated to the topic of Acid Precipitation.

In addition to the examples of achievements cited above, some of the greatest values of international collaboration through the NAFC have resulted from the direct contact between scientists and forestry officials of the member countries.

LEAD AGENCIES

Canadian Forestry Service, Ottawa, Ontario, Canada.

Secretaria de Agricultura y Recursos Hidraulicos, Mexico City, Mexico.

U.S. Forest Service, Washington D.C., USA.

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